

# LIGHT UNFLAVORED MESONS ( $S = C = B = 0$ )

For  $I = 1$  ( $\pi, b, \rho, a$ ):  $u\bar{d}, (u\bar{u} - d\bar{d})/\sqrt{2}, d\bar{u}$ ;  
for  $I = 0$  ( $\eta, \eta', h, h', \omega, \phi, f, f'$ ):  $c_1(u\bar{u} + d\bar{d}) + c_2(s\bar{s})$

**$f_0(600)$**  <sup>[a]</sup>  
or  $\sigma$

$$I^G(J^{PC}) = 0^+(0^{++})$$

Mass  $m = (400\text{--}1200)$  MeV  
Full width  $\Gamma = (600\text{--}1000)$  MeV

## **$f_0(600)$ DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\pi\pi$	dominant	—
$\gamma\gamma$	seen	—

**$\rho(770)$**  <sup>[b]</sup>

$$I^G(J^{PC}) = 1^+(1^{--})$$

Mass  $m = 775.49 \pm 0.34$  MeV  
Full width  $\Gamma = 149.1 \pm 0.8$  MeV  
 $\Gamma_{ee} = 7.04 \pm 0.06$  keV

## **$\rho(770)$ DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$\pi\pi$	~ 100 %		363
<b><math>\rho(770)^{\pm}</math> decays</b>			
$\pi^\pm\gamma$	( $4.5 \pm 0.5$ ) $\times 10^{-4}$	S=2.2	375
$\pi^\pm\eta$	< 6 $\times 10^{-3}$	CL=84%	153
$\pi^\pm\pi^+\pi^-\pi^0$	< 2.0 $\times 10^{-3}$	CL=84%	254
<b><math>\rho(770)^0</math> decays</b>			
$\pi^+\pi^-\gamma$	( $9.9 \pm 1.6$ ) $\times 10^{-3}$		362
$\pi^0\gamma$	( $6.0 \pm 0.8$ ) $\times 10^{-4}$		376
$\eta\gamma$	( $3.00 \pm 0.20$ ) $\times 10^{-4}$		194
$\pi^0\pi^0\gamma$	( $4.5 \pm 0.8$ ) $\times 10^{-5}$		363
$\mu^+\mu^-$	[c] ( $4.55 \pm 0.28$ ) $\times 10^{-5}$		373
$e^+e^-$	[c] ( $4.72 \pm 0.05$ ) $\times 10^{-5}$		388
$\pi^+\pi^-\pi^0$	( $1.01^{+0.54}_{-0.36} \pm 0.34$ ) $\times 10^{-4}$		323
$\pi^+\pi^-\pi^+\pi^-$	( $1.8 \pm 0.9$ ) $\times 10^{-5}$		251
$\pi^+\pi^-\pi^0\pi^0$	( $1.6 \pm 0.8$ ) $\times 10^{-5}$		257
$\pi^0e^+e^-$	< 1.2 $\times 10^{-5}$	CL=90%	376

**$\omega(782)$**

$$I^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 782.65 \pm 0.12$  MeV ( $S = 1.9$ )  
Full width  $\Gamma = 8.49 \pm 0.08$  MeV  
 $\Gamma_{ee} = 0.60 \pm 0.02$  keV

NODE=MXXX005

NODE=M014

NODE=M014M;DTYPE=M;OUR EST;  
→ NOT CHECKED ←  
NODE=M014W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←

NODE=M014215;DESIG=1;OUR EST;  
→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←

NODE=M009

NODE=M009M0;DTYPE=M  
NODE=M009W5;DTYPE=G  
NODE=M009W4;DTYPE=E

NODE=M009225;DESIG=1;OUR EVAL;  
→ NOT CHECKED ←

NODE=M009;CLUMP=A  
DESIG=3  
DESIG=5  
DESIG=21

NODE=M009;CLUMP=B  
DESIG=60  
DESIG=40  
DESIG=8  
DESIG=80  
DESIG=6  
DESIG=4  
DESIG=7;OUR EVAL;→ NOT CHECKED ←  
DESIG=22  
DESIG=30  
DESIG=9

NODE=M001

NODE=M001M;DTYPE=M  
NODE=M001W;DTYPE=G  
NODE=M001W7;DTYPE=E;OUR EVAL;  
→ NOT CHECKED ←

<b><math>\omega(782)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
$\pi^+ \pi^- \pi^0$	(89.2 $\pm$ 0.7) %		327	NODE=M001215;DESIG=1
$\pi^0 \gamma$	(8.28 $\pm$ 0.28) %	S=2.1	380	DESIG=3
$\pi^+ \pi^-$	(1.53 $\pm$ 0.11) %	S=1.2	366	DESIG=2
neutrals (excluding $\pi^0 \gamma$ )	(8 $\pm$ 8) $\times 10^{-3}$	S=1.1	—	DESIG=13
$\eta \gamma$	(4.6 $\pm$ 0.4) $\times 10^{-4}$	S=1.1	200	DESIG=6
$\pi^0 e^+ e^-$	(7.7 $\pm$ 0.6) $\times 10^{-4}$		380	DESIG=14
$\pi^0 \mu^+ \mu^-$	(1.3 $\pm$ 0.4) $\times 10^{-4}$	S=2.1	349	DESIG=11
$e^+ e^-$	(7.28 $\pm$ 0.14) $\times 10^{-5}$	S=1.3	391	DESIG=7
$\pi^+ \pi^- \pi^0 \pi^0$	< 2 $\times 10^{-4}$	CL=90%	262	DESIG=12
$\pi^+ \pi^- \gamma$	< 3.6 $\times 10^{-3}$	CL=95%	366	DESIG=4
$\pi^+ \pi^- \pi^+ \pi^-$	< 1 $\times 10^{-3}$	CL=90%	256	DESIG=15
$\pi^0 \pi^0 \gamma$	(6.6 $\pm$ 1.1) $\times 10^{-5}$		367	DESIG=5
$\eta \pi^0 \gamma$	< 3.3 $\times 10^{-5}$	CL=90%	162	DESIG=17
$\mu^+ \mu^-$	(9.0 $\pm$ 3.1) $\times 10^{-5}$		377	DESIG=8
3 $\gamma$	< 1.9 $\times 10^{-4}$	CL=95%	391	DESIG=10
<b>Charge conjugation (C) violating modes</b>				
$\eta \pi^0$	C < 2.1 $\times 10^{-4}$	CL=90%	162	NODE=M001;CLUMP=A
$2\pi^0$	C < 2.1 $\times 10^{-4}$	CL=90%	367	DESIG=9
$3\pi^0$	C < 2.3 $\times 10^{-4}$	CL=90%	330	DESIG=193
				DESIG=16

 **$\eta'(958)$** 

$$\eta'(958) \rightarrow G(J^P C) = 0^+(0 - +)$$

Mass  $m = 957.78 \pm 0.06$  MeVFull width  $\Gamma = 0.196 \pm 0.012$  MeV (S = 1.2)

NODE=M002

NODE=M002M;DTYPE=M

NODE=M002W;DTYPE=G

<b><math>\eta'(958)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
$\pi^+ \pi^- \eta$	(43.5 $\pm$ 0.9) %	S=1.4	232	NODE=M002215;DESIG=1
$\rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$ )	(29.6 $\pm$ 0.6) %	S=1.2	165	DESIG=9
$\pi^0 \pi^0 \eta$	(21.7 $\pm$ 1.2) %	S=1.5	239	DESIG=2
$\omega \gamma$	(2.77 $\pm$ 0.29) %	S=1.4	159	DESIG=7
$\gamma \gamma$	(2.18 $\pm$ 0.10) %	S=1.3	479	DESIG=6
$3\pi^0$	(1.69 $\pm$ 0.24) $\times 10^{-3}$	S=1.1	430	DESIG=8
$\mu^+ \mu^- \gamma$	(1.07 $\pm$ 0.27) $\times 10^{-4}$		467	DESIG=20
$\pi^+ \pi^- \mu^+ \mu^-$	< 2.2 $\times 10^{-4}$	CL=90%	401	DESIG=201
$\pi^+ \pi^- \pi^0$	(3.6 $\pm$ 1.1) $\times 10^{-3}$		428	DESIG=121
$\pi^0 \rho^0$	< 4 %	CL=90%	111	DESIG=18
$2(\pi^+ \pi^-)$	< 2.4 $\times 10^{-4}$	CL=90%	372	DESIG=131
$\pi^+ \pi^- 2\pi^0$	< 2.6 $\times 10^{-3}$	CL=90%	376	DESIG=202
$2(\pi^+ \pi^-)$ neutrals	< 1 %	CL=95%	—	DESIG=132
$2(\pi^+ \pi^-) \pi^0$	< 1.9 $\times 10^{-3}$	CL=90%	298	DESIG=141
$2(\pi^+ \pi^-) 2\pi^0$	< 1 %	CL=95%	197	DESIG=15
$3(\pi^+ \pi^-)$	< 5 $\times 10^{-4}$	CL=90%	189	DESIG=203
$\pi^+ \pi^- e^+ e^-$	(2.4 $\pm$ 1.3) $\times 10^{-3}$		458	DESIG=10
$\gamma e^+ e^-$	< 9 $\times 10^{-4}$	CL=90%	479	DESIG=28
$\pi^0 \gamma \gamma$	< 8 $\times 10^{-4}$	CL=90%	469	DESIG=24
$4\pi^0$	< 5 $\times 10^{-4}$	CL=90%	380	DESIG=26
$e^+ e^-$	< 2.1 $\times 10^{-7}$	CL=90%	479	DESIG=150
invisible	< 9 $\times 10^{-4}$	CL=90%	—	DESIG=200

**Charge conjugation (*C*), Parity (*P*),  
Lepton family number (*LF*) violating modes**

NODE=M002;CLUMP=B

$\pi^+ \pi^-$	<i>P,CP</i>	< 2.9	$\times 10^{-3}$	CL=90%	458	DESIG=111
$\pi^0 \pi^0$	<i>P,CP</i>	< 1.0	$\times 10^{-3}$	CL=90%	459	DESIG=25
$\pi^0 e^+ e^-$	<i>C</i>	[ <i>d</i> ] < 1.4	$\times 10^{-3}$	CL=90%	469	DESIG=16
$\eta e^+ e^-$	<i>C</i>	[ <i>d</i> ] < 2.4	$\times 10^{-3}$	CL=90%	322	DESIG=17
$3\gamma$	<i>C</i>	< 1.0	$\times 10^{-4}$	CL=90%	479	DESIG=23
$\mu^+ \mu^- \pi^0$	<i>C</i>	[ <i>d</i> ] < 6.0	$\times 10^{-5}$	CL=90%	445	DESIG=22
$\mu^+ \mu^- \eta$	<i>C</i>	[ <i>d</i> ] < 1.5	$\times 10^{-5}$	CL=90%	273	DESIG=21
$e\mu$	<i>LF</i>	< 4.7	$\times 10^{-4}$	CL=90%	473	DESIG=27

**f<sub>0</sub>(980) [e]**

$$I^G(J^{PC}) = 0^+(0^{++})$$

Mass  $m = 980 \pm 10$  MeVFull width  $\Gamma = 40$  to 100 MeV

NODE=M003

NODE=M003M1;DTYPE=M;OUR EST;  
 $\overrightarrow{\text{NOT CHECKED}}$  ←  
 NODE=M003W1;DTYPE=G;OUR EST;  
 $\rightarrow \text{NOT CHECKED}$  ←**f<sub>0</sub>(980) DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	<i>p</i> (MeV/c)
$\pi\pi$	dominant	471
$K\bar{K}$	seen	†
$\gamma\gamma$	seen	490

NODE=M003215;DESIG=2;OUR EVAL;  
 $\overrightarrow{\text{NOT CHECKED}}$  ←  
 DESIG=1;OUR EVAL; $\rightarrow \text{NOT CHECKED}$  ←  
 DESIG=5;OUR EVAL; $\rightarrow \text{NOT CHECKED}$  ←**a<sub>0</sub>(980) [e]**

$$I^G(J^{PC}) = 1^-(0^{++})$$

Mass  $m = 980 \pm 20$  MeVFull width  $\Gamma = 50$  to 100 MeV

NODE=M036

NODE=M036MX;DTYPE=M;OUR EST;  
 $\overrightarrow{\text{NOT CHECKED}}$  ←  
 NODE=M036W1;DTYPE=G;OUR EST;  
 $\rightarrow \text{NOT CHECKED}$  ←**a<sub>0</sub>(980) DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	<i>p</i> (MeV/c)
$\eta\pi$	dominant	319
$K\bar{K}$	seen	†
$\gamma\gamma$	seen	490

NODE=M036215;DESIG=1;OUR EST;  
 $\overrightarrow{\text{NOT CHECKED}}$  ←  
 DESIG=3;OUR EST; $\rightarrow \text{NOT CHECKED}$  ←  
 DESIG=5;OUR EST; $\rightarrow \text{NOT CHECKED}$  ←**ϕ(1020)**

$$I^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 1019.455 \pm 0.020$  MeV (S = 1.1)Full width  $\Gamma = 4.26 \pm 0.04$  MeV (S = 1.4)

NODE=M004

NODE=M004M;DTYPE=M  
 NODE=M004W;DTYPE=G

<b><math>\phi(1020)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
$K^+ K^-$	(48.9 $\pm$ 0.5) %	S=1.1	127	NODE=M004215;DESIG=1
$K_L^0 K_S^0$	(34.2 $\pm$ 0.4) %	S=1.1	110	DESIG=2
$\rho\pi + \pi^+\pi^-\pi^0$	(15.32 $\pm$ 0.32) %	S=1.1	—	DESIG=24
$\eta\gamma$	( 1.309 $\pm$ 0.024) %	S=1.2	363	DESIG=4
$\pi^0\gamma$	( 1.27 $\pm$ 0.06 ) $\times 10^{-3}$		501	DESIG=7
$\ell^+\ell^-$	—		510	DESIG=256;OUR EVAL; → NOT CHECKED ←
$e^+e^-$	( 2.954 $\pm$ 0.030) $\times 10^{-4}$	S=1.1	510	DESIG=5
$\mu^+\mu^-$	( 2.87 $\pm$ 0.19 ) $\times 10^{-4}$		499	DESIG=6
$\eta e^+e^-$	( 1.15 $\pm$ 0.10 ) $\times 10^{-4}$		363	DESIG=17
$\pi^+\pi^-$	( 7.4 $\pm$ 1.3 ) $\times 10^{-5}$		490	DESIG=8
$\omega\pi^0$	( 4.7 $\pm$ 0.5 ) $\times 10^{-5}$		171	DESIG=25
$\omega\gamma$	< 5 %	CL=84%	209	DESIG=10
$\rho\gamma$	< 1.2 $\times 10^{-5}$	CL=90%	215	DESIG=12
$\pi^+\pi^-\gamma$	( 4.1 $\pm$ 1.3 ) $\times 10^{-5}$		490	DESIG=9
$f_0(980)\gamma$	( 3.22 $\pm$ 0.19 ) $\times 10^{-4}$	S=1.1	39	DESIG=20
$\pi^0\pi^0\gamma$	( 1.13 $\pm$ 0.06 ) $\times 10^{-4}$		492	DESIG=19
$\pi^+\pi^-\pi^+\pi^-$	( 4.0 $\pm$ 2.8 ) $\times 10^{-6}$		410	DESIG=15
$\pi^+\pi^+\pi^-\pi^-\pi^0$	< 4.6 $\times 10^{-6}$	CL=90%	342	DESIG=14
$\pi^0e^+e^-$	( 1.12 $\pm$ 0.28 ) $\times 10^{-5}$		501	DESIG=21
$\pi^0\eta\gamma$	( 7.27 $\pm$ 0.30 ) $\times 10^{-5}$	S=1.5	346	DESIG=22
$a_0(980)\gamma$	( 7.6 $\pm$ 0.6 ) $\times 10^{-5}$		39	DESIG=23
$K^0\bar{K}^0\gamma$	< 1.9 $\times 10^{-8}$	CL=90%	110	DESIG=257
$\eta'(958)\gamma$	( 6.25 $\pm$ 0.21 ) $\times 10^{-5}$		60	DESIG=194
$\eta\pi^0\pi^0\gamma$	< 2 $\times 10^{-5}$	CL=90%	293	DESIG=195
$\mu^+\mu^-\gamma$	( 1.4 $\pm$ 0.5 ) $\times 10^{-5}$		499	DESIG=196
$\rho\gamma\gamma$	< 1.2 $\times 10^{-4}$	CL=90%	215	DESIG=250
$\eta\pi^+\pi^-$	< 1.8 $\times 10^{-5}$	CL=90%	288	DESIG=255
$\eta\mu^+\mu^-$	< 9.4 $\times 10^{-6}$	CL=90%	321	DESIG=26

 **$h_1(1170)$** 

$I^G(J^{PC}) = 0^-(1^{+-})$

Mass  $m = 1170 \pm 20$  MeVFull width  $\Gamma = 360 \pm 40$  MeV **$h_1(1170)$  DECAY MODES**

Fraction ( $\Gamma_i/\Gamma$ )

$p$  (MeV/c)

$\rho\pi$

seen

307

NODE=M030

NODE=M030M;DTYPE=M;OUR EST;  
→ NOT CHECKED ←  
NODE=M030W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←NODE=M030215;DESIG=1;OUR EST;  
→ NOT CHECKED ← **$b_1(1235)$** 

$I^G(J^{PC}) = 1^+(1^{+-})$

Mass  $m = 1229.5 \pm 3.2$  MeV (S = 1.6)Full width  $\Gamma = 142 \pm 9$  MeV (S = 1.2) **$b_1(1235)$  DECAY MODES**

Fraction ( $\Gamma_i/\Gamma$ )

Confidence level (MeV/c)

$\omega\pi$

dominant

348

[D/S amplitude ratio = 0.277  $\pm$  0.027]

$\pi^\pm\gamma$

( 1.6  $\pm$  0.4 )  $\times 10^{-3}$

607

$\eta\rho$

seen

†

$\pi^+\pi^+\pi^-\pi^0$

&lt; 50 %

84%

535

$(K\bar{K})^\pm\pi^0$

&lt; 8 %

90%

248

$K_S^0 K_S^0\pi^\pm$

&lt; 6 %

90%

235

$K_S^0 K_S^0\pi^\pm$

&lt; 2 %

90%

235

$\phi\pi$

&lt; 1.5 %

84%

147

NODE=M011215;DESIG=1;OUR EST;  
→ NOT CHECKED ←

DESIG=9

DESIG=8;OUR EST;→ NOT CHECKED ←

DESIG=2;OUR EST;→ NOT CHECKED ←

DESIG=71;OUR EST;→ NOT CHECKED ←

DESIG=73;OUR EST;→ NOT CHECKED ←

DESIG=72;OUR EST;→ NOT CHECKED ←

DESIG=5;OUR EST;→ NOT CHECKED ←

 **$a_1(1260)$  [f]**

$I^G(J^{PC}) = 1^-(1^{++})$

Mass  $m = 1230 \pm 40$  MeV [g]Full width  $\Gamma = 250$  to 600 MeV

NODE=M010

NODE=M010M;DTYPE=M;OUR EST;  
→ NOT CHECKED ←  
NODE=M010W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←

**$a_1(1260)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$(\rho\pi)_{S-\text{wave}}$	seen	353
$(\rho\pi)_{D-\text{wave}}$	seen	353
$(\rho(1450)\pi)_{S-\text{wave}}$	seen	†
$(\rho(1450)\pi)_{D-\text{wave}}$	seen	†
$\sigma\pi$	seen	—
$f_0(980)\pi$	not seen	189
$f_0(1370)\pi$	seen	†
$f_2(1270)\pi$	seen	†
$K\bar{K}^*(892) + \text{c.c.}$	seen	†
$\pi\gamma$	seen	608

NODE=M010215;DESIG=7;OUR EST;  
 DESIG=8;OUR EST;→ NOT CHECKED ←  
 DESIG=9;OUR EST;→ NOT CHECKED ←  
 DESIG=10;OUR EST;→ NOT CHECKED ←  
 DESIG=16;OUR EST;→ NOT CHECKED ←  
 DESIG=11;OUR EST;→ NOT CHECKED ←  
 DESIG=12;OUR EST;→ NOT CHECKED ←  
 DESIG=13;OUR EST;→ NOT CHECKED ←  
 DESIG=14;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←

 **$f_2(1270)$** 

$$I^G(J^{PC}) = 0^+(2^{++})$$

Mass  $m = 1275.1 \pm 1.2$  MeV (S = 1.1)  
 Full width  $\Gamma = 185.1^{+2.9}_{-2.4}$  MeV (S = 1.5)

 **$f_2(1270)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$\pi\pi$	(84.8 $^{+2.4}_{-1.2}$ %)	S=1.2	623
$\pi^+\pi^-2\pi^0$	( 7.1 $^{+1.4}_{-2.7}$ %)	S=1.3	562
$K\bar{K}$	( 4.6 $\pm 0.4$ %)	S=2.8	403
$2\pi^+2\pi^-$	( 2.8 $\pm 0.4$ %)	S=1.2	559
$\eta\eta$	( 4.0 $\pm 0.8$ ) $\times 10^{-3}$	S=2.1	326
$4\pi^0$	( 3.0 $\pm 1.0$ ) $\times 10^{-3}$		564
$\gamma\gamma$	( 1.64 $\pm 0.19$ ) $\times 10^{-5}$	S=1.9	638
$\eta\pi\pi$	< 8 $\times 10^{-3}$	CL=95%	477
$K^0K^-\pi^+$ + c.c.	< 3.4 $\times 10^{-3}$	CL=95%	293
$e^+e^-$	< 6 $\times 10^{-10}$	CL=90%	638

NODE=M005

NODE=M005M;DTYPE=M

NODE=M005W;DTYPE=G

NODE=M005215;DESIG=1

DESIG=3

DESIG=4

DESIG=2

DESIG=7

DESIG=9

DESIG=8

DESIG=6

DESIG=5

DESIG=10

 **$f_1(1285)$** 

$$I^G(J^{PC}) = 0^+(1^{++})$$

Mass  $m = 1281.8 \pm 0.6$  MeV (S = 1.6)  
 Full width  $\Gamma = 24.3 \pm 1.1$  MeV (S = 1.4)

 **$f_1(1285)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$4\pi$	(33.1 $^{+2.1}_{-1.8}$ %)	S=1.3	568
$\pi^0\pi^0\pi^+\pi^-$	(22.0 $^{+1.4}_{-1.2}$ %)	S=1.3	566
$2\pi^+2\pi^-$	(11.0 $^{+0.7}_{-0.6}$ %)	S=1.3	563
$\rho^0\pi^+\pi^-$	(11.0 $^{+0.7}_{-0.6}$ %)	S=1.3	336
$\rho^0\rho^0$	seen		†
$4\pi^0$	< 7 $\times 10^{-4}$	CL=90%	568
$\eta\pi\pi$	(52 $\pm 16$ %)		482
$a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\bar{K}$ ]	(36 $\pm 7$ %)		238
$\eta\pi\pi$ [excluding $a_0(980)\pi$ ]	(16 $\pm 7$ %)		482
$K\bar{K}\pi$	( 9.0 $\pm 0.4$ %)	S=1.1	308
$K\bar{K}^*(892)$	not seen		†
$\gamma\rho^0$	( 5.5 $\pm 1.3$ %)	S=2.8	406
$\phi\gamma$	( 7.4 $\pm 2.6$ ) $\times 10^{-4}$		236

NODE=M008

NODE=M008M;DTYPE=M

NODE=M008W;DTYPE=G

NODE=M008215;DESIG=21

DESIG=22

DESIG=20

DESIG=191

DESIG=23;OUR EST;→ NOT CHECKED ←  
 DESIG=7

DESIG=3

DESIG=4

DESIG=5

DESIG=1

DESIG=6

DESIG=13

DESIG=10

 **$\eta(1295)$** 

$$I^G(J^{PC}) = 0^+(0^{-+})$$

Mass  $m = 1294 \pm 4$  MeV (S = 1.6)  
 Full width  $\Gamma = 55 \pm 5$  MeV

NODE=M037

NODE=M037M;DTYPE=M

NODE=M037W;DTYPE=G

**$\eta(1295)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\eta\pi^+\pi^-$	seen	487
$a_0(980)\pi$	seen	248
$\eta\pi^0\pi^0$	seen	490
$\eta(\pi\pi)_{S\text{-wave}}$	seen	-

 **$\pi(1300)$** 

$$I^G(J^{PC}) = 1^-(0^{-+})$$

Mass  $m = 1300 \pm 100$  MeV [g]  
Full width  $\Gamma = 200$  to 600 MeV

 **$\pi(1300)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\rho\pi$	seen	404
$\pi(\pi\pi)_{S\text{-wave}}$	seen	-

 **$a_2(1320)$** 

$$I^G(J^{PC}) = 1^-(2^{++})$$

Mass  $m = 1318.3 \pm 0.6$  MeV (S = 1.2)  
Full width  $\Gamma = 107 \pm 5$  MeV [g]

 **$a_2(1320)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$3\pi$	(70.1 ± 2.7) %	S=1.2	624
$\eta\pi$	(14.5 ± 1.2) %		535
$\omega\pi\pi$	(10.6 ± 3.2) %	S=1.3	366
$K\bar{K}$	(4.9 ± 0.8) %		437
$\eta'(958)\pi$	(5.3 ± 0.9) × 10 <sup>-3</sup>		288
$\pi^\pm\gamma$	(2.68 ± 0.31) × 10 <sup>-3</sup>		652
$\gamma\gamma$	(9.4 ± 0.7) × 10 <sup>-6</sup>		659
$e^+e^-$	< 5 × 10 <sup>-9</sup>	CL=90%	659

 **$f_0(1370)$  [e]**

$$I^G(J^{PC}) = 0^+(0^{++})$$

Mass  $m = 1200$  to 1500 MeV  
Full width  $\Gamma = 200$  to 500 MeV

 **$f_0(1370)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\pi\pi$	seen	672
$4\pi$	seen	617
$4\pi^0$	seen	617
$2\pi^+2\pi^-$	seen	612
$\pi^+\pi^-2\pi^0$	seen	615
$\rho\rho$	dominant	†
$2(\pi\pi)_{S\text{-wave}}$	seen	-
$\pi(1300)\pi$	seen	†
$a_1(1260)\pi$	seen	35
$\eta\eta$	seen	411
$K\bar{K}$	seen	475
$K\bar{K}n\pi$	not seen	†
$6\pi$	not seen	508
$\omega\omega$	not seen	†
$\gamma\gamma$	seen	685
$e^+e^-$	not seen	685

 **$\pi_1(1400)$  [h]**

$$I^G(J^{PC}) = 1^-(1^{-+})$$

Mass  $m = 1351 \pm 30$  MeV (S = 2.0)  
Full width  $\Gamma = 313 \pm 40$  MeV

NODE=M037215;DESIG=2;OUR EST;  
DESIG=1;OUR EST;→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←

NODE=M058

NODE=M058M;DTYPE=M;OUR EST;  
NODE=M058W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←

NODE=M058215;DESIG=1;OUR EST;  
DESIG=3;OUR EST;→ NOT CHECKED ←

NODE=M012

NODE=M012M0;DTYPE=M  
NODE=M012W0;DTYPE=G;OUR EST;  
→ NOT CHECKED ←

NODE=M012215;DESIG=1

DESIG=3  
DESIG=4  
DESIG=2  
DESIG=8  
DESIG=7  
DESIG=9  
DESIG=10

NODE=M147

NODE=M147M;DTYPE=M;OUR EST;  
NODE=M147W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←

NODE=M147215;DESIG=1;OUR EST;  
DESIG=10;OUR EST;→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=6;OUR EST;→ NOT CHECKED ←  
DESIG=14;OUR EST;→ NOT CHECKED ←  
DESIG=15;OUR EST;→ NOT CHECKED ←  
DESIG=16;OUR EVAL;  
DESIG=17;OUR EVAL;  
DESIG=2;OUR EST;→ NOT CHECKED ←  
DESIG=11;OUR EST;→ NOT CHECKED ←  
DESIG=18;OUR EVAL;  
DESIG=19;OUR EVAL;  
DESIG=20;OUR EVAL;  
DESIG=12;OUR EST;→ NOT CHECKED ←  
DESIG=13;OUR EST;→ NOT CHECKED ←

NODE=M111

NODE=M111M;DTYPE=M  
NODE=M111W;DTYPE=G

**$\pi_1(1400)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$\eta\pi^0$	seen	555
$\eta\pi^-$	seen	554

 **$\eta(1405)$  [i]**

$$I^G(J^{PC}) = 0^+(0^{+-})$$

Mass  $m = 1409.8 \pm 2.5$  MeV [g] (S = 2.2)Full width  $\Gamma = 51.1 \pm 3.4$  MeV [g] (S = 2.0) **$\eta(1405)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ )

Confidence level

 $p$  (MeV/c)

$K\bar{K}\pi$	seen	425
$\eta\pi\pi$	seen	563
$a_0(980)\pi$	seen	345
$\eta(\pi\pi)_{S\text{-wave}}$	seen	—
$f_0(980)\eta$	seen	†
$4\pi$	seen	639
$\rho\rho$	<58 %	99.85%
$\rho^0\gamma$	seen	492
$K^*(892)K$	seen	125

 **$f_1(1420)$  [j]**

$$I^G(J^{PC}) = 0^+(1^{++})$$

Mass  $m = 1426.4 \pm 0.9$  MeV (S = 1.1)Full width  $\Gamma = 54.9 \pm 2.6$  MeV **$f_1(1420)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$K\bar{K}\pi$	dominant	438
$K\bar{K}^*(892) + \text{c.c.}$	dominant	163
$\eta\pi\pi$	possibly seen	573
$\phi\gamma$	seen	349

 **$\omega(1420)$  [k]**

$$I^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m$  (1400–1450) MeVFull width  $\Gamma$  (180–250) MeV **$\omega(1420)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$\rho\pi$	dominant	486
$\omega\pi\pi$	seen	444
$b_1(1235)\pi$	seen	125
$e^+e^-$	seen	710

 **$a_0(1450)$  [e]**

$$I^G(J^{PC}) = 1^-(0^{++})$$

Mass  $m = 1474 \pm 19$  MeVFull width  $\Gamma = 265 \pm 13$  MeVNODE=M111215;DESIG=1;OUR EST;  
→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←

NODE=M027

NODE=M027MX;DTYPE=M

NODE=M027WX;DTYPE=G

NODE=M027215;DESIG=2;OUR EST;  
→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=9;OUR EST;→ NOT CHECKED ←  
DESIG=10;OUR EST;→ NOT CHECKED ←  
DESIG=6;OUR EST;→ NOT CHECKED ←  
DESIG=12  
DESIG=8;OUR EST;→ NOT CHECKED ←  
DESIG=11;OUR EST;→ NOT CHECKED ←

NODE=M006

NODE=M006M2;DTYPE=M

NODE=M006W;DTYPE=G

NODE=M006215;DESIG=2;OUR EST;  
→ NOT CHECKED ←  
DESIG=1;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=9;OUR EST;→ NOT CHECKED ←

NODE=M125

NODE=M125M;DTYPE=M;OUR EST;  
→ NOT CHECKED ←  
NODE=M125W;DTYPE=G;OUR EST;  
→ NOT CHECKED ←NODE=M125215;DESIG=1;OUR EST;  
→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=3;OUR EST;→ NOT CHECKED ←

NODE=M149

NODE=M149M;DTYPE=M

NODE=M149W;DTYPE=G

**$a_0(1450)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$\pi\eta$	seen	627
$\pi\eta'(958)$	seen	410
$K\bar{K}$	seen	547
$\omega\pi\pi$	seen	484
$a_0(980)\pi\pi$	seen	342
$\gamma\gamma$	seen	737

 **$\rho(1450)$  [i]**

$$I^G(J^{PC}) = 1^+(1^{--})$$

Mass  $m = 1465 \pm 25$  MeV [g]  
 Full width  $\Gamma = 400 \pm 60$  MeV [g]

 **$\rho(1450)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$\pi\pi$	seen	720
$4\pi$	seen	669
$e^+e^-$	seen	732
$\eta\rho$	possibly seen	310
$a_2(1320)\pi$	not seen	55
$K\bar{K}$	not seen	541
$K\bar{K}^*(892) + \text{c.c.}$	possibly seen	229
$\eta\gamma$	possibly seen	630

 **$\eta(1475)$  [i]**

$$I^G(J^{PC}) = 0^+(0^{+-})$$

Mass  $m = 1476 \pm 4$  MeV ( $S = 1.3$ )  
 Full width  $\Gamma = 85 \pm 9$  MeV ( $S = 1.5$ )

 **$\eta(1475)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$K\bar{K}\pi$	dominant	477
$K\bar{K}^*(892) + \text{c.c.}$	seen	245
$a_0(980)\pi$	seen	396
$\gamma\gamma$	seen	738

 **$f_0(1500)$  [h]**

$$I^G(J^{PC}) = 0^+(0^{++})$$

Mass  $m = 1505 \pm 6$  MeV ( $S = 1.3$ )  
 Full width  $\Gamma = 109 \pm 7$  MeV

 **$f_0(1500)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ )Scale factor  
(MeV/c)

$\pi\pi$	(34.9 ± 2.3) %	1.2	741
$\pi^+\pi^-$	seen	740	
$2\pi^0$	seen	741	
$4\pi$	(49.5 ± 3.3) %	1.2	691
$4\pi^0$	seen	691	
$2\pi^+2\pi^-$	seen	687	
$\eta\eta$	( 5.1 ± 0.9) %	1.4	516
$\eta\eta'(958)$	( 1.9 ± 0.8) %	1.7	†
$K\bar{K}$	( 8.6 ± 1.0) %	1.1	568
$\gamma\gamma$	not seen	753	

 **$f'_2(1525)$** 

$$I^G(J^{PC}) = 0^+(2^{++})$$

Mass  $m = 1525 \pm 5$  MeV [g]  
 Full width  $\Gamma = 73^{+6}_{-5}$  MeV [g]

NODE=M149215;DESIG=1;OUR EST;  
 DESIG=2;OUR EST;→ NOT CHECKED ←  
 DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←  
 DESIG=5  
 DESIG=6

NODE=M105

NODE=M105M0;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M105W0;DTYPE=G;OUR EST;  
 → NOT CHECKED ←

NODE=M105215;DESIG=1;OUR EST;  
 DESIG=2;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←  
 DESIG=3;OUR EVAL;→ NOT CHECKED ←  
 DESIG=8;OUR EST;→ NOT CHECKED ←  
 DESIG=7;OUR EVAL;→ NOT CHECKED ←  
 DESIG=15;OUR EST;→ NOT CHECKED ←  
 DESIG=9;OUR EST;→ NOT CHECKED ←

NODE=M175

NODE=M175M5;DTYPE=M  
 NODE=M175W5;DTYPE=G

NODE=M175215;DESIG=2;OUR EST;  
 DESIG=1;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←  
 DESIG=7;OUR EST;→ NOT CHECKED ←

NODE=M152

NODE=M152M;DTYPE=M  
 NODE=M152W;DTYPE=G

NODE=M152215;DESIG=8  
 DESIG=9  
 DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=7  
 DESIG=5;OUR EST;→ NOT CHECKED ←  
 DESIG=6;OUR EST;→ NOT CHECKED ←  
 DESIG=1  
 DESIG=2  
 DESIG=4  
 DESIG=10;OUR EST;→ NOT CHECKED ←

NODE=M013

NODE=M013MX;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M013WX;DTYPE=G

**$f'_2(1525)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\bar{K}$	(88.7 $\pm$ 2.2) %	581
$\eta\eta$	(10.4 $\pm$ 2.2) %	530
$\pi\pi$	( 8.2 $\pm$ 1.5) $\times$ 10 $^{-3}$	750
$\gamma\gamma$	( 1.11 $\pm$ 0.14) $\times$ 10 $^{-6}$	763

 **$\pi_1(1600)$  [h]**

$$I^G(J^{PC}) = 1^-(1^-+)$$

Mass  $m = 1662^{+15}_{-11}$  MeV (S = 1.2)  
 Full width  $\Gamma = 234 \pm 50$  MeV (S = 1.7)

 **$\pi_1(1600)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\pi\pi\pi$	not seen	803
$\rho^0\pi^-$	not seen	641
$f_2(1270)\pi^-$	not seen	319
$b_1(1235)\pi$	seen	357
$\eta'(958)\pi^-$	seen	543
$f_1(1285)\pi$	seen	315

 **$\eta_2(1645)$** 

$$I^G(J^{PC}) = 0^+(2^-+)$$

Mass  $m = 1617 \pm 5$  MeV  
 Full width  $\Gamma = 181 \pm 11$  MeV

 **$\eta_2(1645)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$a_2(1320)\pi$	seen	242
$K\bar{K}\pi$	seen	580
$K^*\bar{K}$	seen	404
$\eta\pi^+\pi^-$	seen	685
$a_0(980)\pi$	seen	499
$f_2(1270)\eta$	not seen	†

 **$\omega(1650)$  [m]**

$$I^G(J^{PC}) = 0^-(1^- -)$$

Mass  $m = 1670 \pm 30$  MeV  
 Full width  $\Gamma = 315 \pm 35$  MeV

 **$\omega(1650)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\rho\pi$	seen	646
$\omega\pi\pi$	seen	617
$\omega\eta$	seen	500
$e^+e^-$	seen	835

 **$\omega_3(1670)$** 

$$I^G(J^{PC}) = 0^-(3^- -)$$

Mass  $m = 1667 \pm 4$  MeV  
 Full width  $\Gamma = 168 \pm 10$  MeV [g]

NODE=M013215;DESIG=2  
 DESIG=4  
 DESIG=1  
 DESIG=8

NODE=M164

NODE=M164M;DTYPE=M  
 NODE=M164W;DTYPE=G

NODE=M164215;DESIG=1;OUR EST;  
 $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=2  
 DESIG=4  
 DESIG=5  
 DESIG=3  
 DESIG=6;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

NODE=M154

NODE=M154M;DTYPE=M  
 NODE=M154W;DTYPE=G

NODE=M154215;DESIG=1;OUR EST;  
 $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=2;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=3;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=4;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=5;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=6;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

NODE=M126

NODE=M126M;DTYPE=M;OUR EST;  
 $\rightarrow$  NOT CHECKED  $\leftarrow$   
 NODE=M126W;DTYPE=G;OUR EST;  
 $\rightarrow$  NOT CHECKED  $\leftarrow$

NODE=M126215;DESIG=1;OUR EST;  
 $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=2;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=4;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$   
 DESIG=3;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

NODE=M045

NODE=M045M;DTYPE=M  
 NODE=M045W;DTYPE=G

**$\omega_3(1670)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\rho\pi$	seen	645
$\omega\pi\pi$	seen	615
$b_1(1235)\pi$	possibly seen	361

 **$\pi_2(1670)$** 

$$I^G(J^{PC}) = 1^-(2^-+)$$

Mass  $m = 1672.4 \pm 3.2$  MeV [g] ( $S = 1.4$ )  
 Full width  $\Gamma = 259 \pm 9$  MeV [g] ( $S = 1.3$ )

 **$\pi_2(1670)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$3\pi$	(95.8 ± 1.4) %		809
$f_2(1270)\pi$	(56.3 ± 3.2) %		329
$\rho\pi$	(31 ± 4) %		648
$\sigma\pi$	(10.9 ± 3.4) %		—
$(\pi\pi)_S$ -wave	(8.7 ± 3.4) %		—
$K\bar{K}^*(892) + c.c.$	(4.2 ± 1.4) %		455
$\omega\rho$	(2.7 ± 1.1) %		304
$\gamma\gamma$	< 2.8 × 10 <sup>-7</sup>	90%	836
$\rho(1450)\pi$	< 3.6 × 10 <sup>-3</sup>	97.7%	148
$b_1(1235)\pi$	< 1.9 × 10 <sup>-3</sup>	97.7%	366
$f_1(1285)\pi$	possibly seen		323
$a_2(1320)\pi$	not seen		292

 **$\phi(1680)$** 

$$I^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 1680 \pm 20$  MeV [g]  
 Full width  $\Gamma = 150 \pm 50$  MeV [g]

 **$\phi(1680)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\bar{K}^*(892) + c.c.$	dominant	462
$K_S^0 K\pi$	seen	621
$KK$	seen	680
$e^+e^-$	seen	840
$\omega\pi\pi$	not seen	623
$K^+K^-\pi^+\pi^-$	seen	544

 **$\rho_3(1690)$** 

$$I^G(J^{PC}) = 1^+(3^{--})$$

Mass  $m = 1688.8 \pm 2.1$  MeV [g]  
 Full width  $\Gamma = 161 \pm 10$  MeV [g] ( $S = 1.5$ )

 **$\rho_3(1690)$  DECAY MODES**

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor	$p$ (MeV/c)
$4\pi$	(71.1 ± 1.9) %		790
$\pi^\pm\pi^+\pi^-\pi^0$	(67 ± 22) %		787
$\omega\pi$	(16 ± 6) %		655
$\pi\pi$	(23.6 ± 1.3) %		834
$K\bar{K}\pi$	(3.8 ± 1.2) %		629
$K\bar{K}$	(1.58 ± 0.26) %	1.2	685
$\eta\pi^+\pi^-$	seen		727
$\rho(770)\eta$	seen		520
$\pi\pi\rho$	seen		633
Excluding $2\rho$ and $a_2(1320)\pi$ .			
$a_2(1320)\pi$	seen		307
$\rho\rho$	seen		334

 **$\rho(1700)$  [I]**

$$I^G(J^{PC}) = 1^+(1^{--})$$

Mass  $m = 1720 \pm 20$  MeV [g] ( $\eta\rho^0$  and  $\pi^+\pi^-$  modes)  
 Full width  $\Gamma = 250 \pm 100$  MeV [g] ( $\eta\rho^0$  and  $\pi^+\pi^-$  modes)

NODE=M045215;DESIG=1;OUR EST;  
 → NOT CHECKED ← NOT CHECKED ←  
 DESIG=2;OUR EST;→ NOT CHECKED ←  
 DESIG=3;OUR EST;→ NOT CHECKED ←

NODE=M034

NODE=M034M;DTYPE=M  
 NODE=M034W;DTYPE=G

NODE=M034215;DESIG=20  
 DESIG=8  
 DESIG=2  
 DESIG=13  
 DESIG=11  
 DESIG=5  
 DESIG=14  
 DESIG=12  
 DESIG=15  
 DESIG=16  
 DESIG=25  
 DESIG=26

NODE=M067

NODE=M067M1;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M067W1;DTYPE=G;OUR EST;  
 → NOT CHECKED ←

NODE=M067215;DESIG=4;OUR EST;  
 → NOT CHECKED ← NOT CHECKED ←  
 DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=6;OUR EST;→ NOT CHECKED ←  
 DESIG=1;OUR EST;→ NOT CHECKED ←  
 DESIG=12;OUR EVAL;  
 → NOT CHECKED ←

NODE=M015

NODE=M015M;DTYPE=M  
 NODE=M015W;DTYPE=G

NODE=M015215;DESIG=2

DESIG=11  
 DESIG=7  
 DESIG=1  
 DESIG=3  
 DESIG=4  
 DESIG=13  
 DESIG=14;OUR EST;→ NOT CHECKED ←  
 DESIG=5;OUR EST;→ NOT CHECKED ←  
 DESIG=6;OUR EST;→ NOT CHECKED ←  
 DESIG=8;OUR EST;→ NOT CHECKED ←  
 DESIG=9;OUR EST;→ NOT CHECKED ←

NODE=M065

NODE=M065M0;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M065W0;DTYPE=G;OUR EST;  
 → NOT CHECKED ←

<b>f(1700) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$2(\pi^+ \pi^-)$	large	803
$\rho \pi \pi$	dominant	653
$\rho^0 \pi^+ \pi^-$	large	650
$\rho^\pm \pi^\mp \pi^0$	large	652
$a_1(1260)\pi$	seen	404
$h_1(1170)\pi$	seen	447
$\pi(1300)\pi$	seen	349
$\rho\rho$	seen	372
$\pi^+ \pi^-$	seen	849
$\pi\pi$	seen	849
$K\bar{K}^*(892) + \text{c.c.}$	seen	496
$\eta\rho$	seen	545
$a_2(1320)\pi$	not seen	334
$K\bar{K}$	seen	704
$e^+ e^-$	seen	860
$\pi^0 \omega$	seen	674

**f<sub>0</sub>(1710) [n]**

$I^G(J^{PC}) = 0^+(0^{++})$

Mass  $m = 1720 \pm 6$  MeV (S = 1.6)  
 Full width  $\Gamma = 135 \pm 8$  MeV (S = 1.1)

<b>f<sub>0</sub>(1710) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\bar{K}$	seen	704
$\eta\eta$	seen	663
$\pi\pi$	seen	849
$\omega\omega$	seen	357

 **$\pi(1800)$** 

$I^G(J^{PC}) = 1^-(0^{-+})$

Mass  $m = 1816 \pm 14$  MeV (S = 2.3)  
 Full width  $\Gamma = 208 \pm 12$  MeV

<b><math>\pi(1800)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\pi^+ \pi^- \pi^-$	seen	881
$f_0(600)\pi^-$	seen	—
$f_0(980)\pi^-$	seen	634
$f_0(1370)\pi^-$	seen	371
$f_0(1500)\pi^-$	not seen	254
$\rho\pi^-$	not seen	735
$\eta\eta\pi^-$	seen	664
$a_0(980)\eta$	seen	477
$a_2(1320)\eta$	not seen	†
$f_2(1270)\pi$	not seen	445
$f_0(1370)\pi^-$	not seen	371
$f_0(1500)\pi^-$	seen	254
$\eta\eta'(958)\pi^-$	seen	380
$K_0^*(1430)K^-$	seen	†
$K^*(892)K^-$	not seen	573

 **$\phi_3(1850)$** 

$I^G(J^{PC}) = 0^-(3^{--})$

Mass  $m = 1854 \pm 7$  MeV  
 Full width  $\Gamma = 87^{+28}_{-23}$  MeV (S = 1.2)

NODE=M065215;DESIG=2;OUR EST;  
 DESIG=NOT CHECKED;OUR EST;→ NOT CHECKED ←  
 DESIG=12;OUR EST;→ NOT CHECKED ←  
 DESIG=1;OUR EST;→ NOT CHECKED ←  
 DESIG=9;OUR EST;→ NOT CHECKED ←  
 DESIG=15;OUR EST;→ NOT CHECKED ←  
 DESIG=16;OUR EST;→ NOT CHECKED ←  
 DESIG=17;OUR EST;→ NOT CHECKED ←  
 DESIG=18;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←  
 DESIG=13;OUR EST;→ NOT CHECKED ←  
 DESIG=10;OUR EST;→ NOT CHECKED ←  
 DESIG=11;OUR EST;→ NOT CHECKED ←  
 DESIG=14;OUR EST;→ NOT CHECKED ←  
 DESIG=5;OUR EST;→ NOT CHECKED ←  
 DESIG=8;OUR EST;→ NOT CHECKED ←  
 DESIG=6;OUR EST;→ NOT CHECKED ←

NODE=M068

NODE=M068M;DTYPE=M  
 NODE=M068W;DTYPE=G

NODE=M068215;DESIG=2;OUR EST;  
 DESIG=NOT CHECKED;OUR EST;→ NOT CHECKED ←  
 DESIG=5;OUR EST;→ NOT CHECKED ←  
 DESIG=4

NODE=M075

NODE=M075M;DTYPE=M  
 NODE=M075W;DTYPE=G

NODE=M075215;DESIG=10;OUR EST;  
 DESIG=NOT CHECKED;OUR EST;→ NOT CHECKED ←  
 DESIG=11;OUR EST;→ NOT CHECKED ←  
 DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=1  
 DESIG=12  
 DESIG=2  
 DESIG=7;OUR EST;→ NOT CHECKED ←  
 DESIG=5;OUR EST;→ NOT CHECKED ←  
 DESIG=13  
 DESIG=14  
 DESIG=15  
 DESIG=6;OUR EST;→ NOT CHECKED ←  
 DESIG=8;OUR EST;→ NOT CHECKED ←  
 DESIG=4  
 DESIG=9

NODE=M054

NODE=M054M;DTYPE=M  
 NODE=M054W;DTYPE=G

**$\phi_3(1850)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$K\bar{K}$	seen	785
$K\bar{K}^*(892) + \text{c.c.}$	seen	602

 **$\pi_2(1880)$** 

$I^G(J^{PC}) = 1^-(2^-+)$

Mass  $m = 1895 \pm 16$  MeVFull width  $\Gamma = 235 \pm 34$  MeV **$f_2(1950)$** 

$I^G(J^{PC}) = 0^+(2^{++})$

Mass  $m = 1944 \pm 12$  MeV (S = 1.5)Full width  $\Gamma = 472 \pm 18$  MeV **$f_2(1950)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$K^*(892)\bar{K}^*(892)$	seen	387
$\pi^+\pi^-$	seen	962
$\pi^0\pi^0$	seen	963
$4\pi$	seen	925
$\eta\eta$	seen	803
$K\bar{K}$	seen	837
$\gamma\gamma$	seen	972

 **$f_2(2010)$** 

$I^G(J^{PC}) = 0^+(2^{++})$

Mass  $m = 2011^{+60}_{-80}$  MeVFull width  $\Gamma = 202 \pm 60$  MeV **$f_2(2010)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$\phi\phi$	seen	†
$K\bar{K}$	seen	876

 **$a_4(2040)$** 

$I^G(J^{PC}) = 1^-(4^{++})$

Mass  $m = 2001 \pm 10$  MeVFull width  $\Gamma = 313 \pm 31$  MeV **$a_4(2040)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$K\bar{K}$	seen	870
$\pi^+\pi^-\pi^0$	seen	977
$\rho\pi$	seen	844
$f_2(1270)\pi$	seen	583
$\omega\pi^-\pi^0$	seen	822
$\omega\rho$	seen	628
$\eta\pi^0$	seen	920
$\eta'(958)\pi$	seen	764

 **$f_4(2050)$** 

$I^G(J^{PC}) = 0^+(4^{++})$

Mass  $m = 2018 \pm 11$  MeV (S = 2.1)Full width  $\Gamma = 237 \pm 18$  MeV (S = 1.9)NODE=M054215;DESIG=1;OUR EST;  
DESIG=2;OUR EST;→ NOT CHECKED ←  
DESIG=3;OUR EST;→ NOT CHECKED ←

NODE=M185

NODE=M185M;DTYPE=M

NODE=M185W;DTYPE=G

NODE=M135

NODE=M135M;DTYPE=M

NODE=M135W;DTYPE=G

NODE=M135215;DESIG=1

DESIG=2;OUR EST;→ NOT CHECKED ←  
DESIG=3;OUR EST;→ NOT CHECKED ←  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=6;OUR EST;→ NOT CHECKED ←  
DESIG=7;OUR EST;→ NOT CHECKED ←  
DESIG=8;OUR EST;→ NOT CHECKED ←  
DESIG=9;OUR EST;→ NOT CHECKED ←

NODE=M106

NODE=M106M;DTYPE=M

NODE=M106W;DTYPE=G

NODE=M106215;DESIG=1;OUR EST;  
DESIG=2;OUR EST;→ NOT CHECKED ←

NODE=M017

NODE=M017M;DTYPE=M

NODE=M017W;DTYPE=G

NODE=M017215;DESIG=1

DESIG=2  
DESIG=3  
DESIG=4;OUR EST;→ NOT CHECKED ←  
DESIG=5;OUR EST;→ NOT CHECKED ←  
DESIG=6;OUR EST;→ NOT CHECKED ←  
DESIG=7;OUR EST;→ NOT CHECKED ←  
DESIG=8  
DESIG=9;OUR EST;→ NOT CHECKED ←

NODE=M016

NODE=M016M;DTYPE=M

NODE=M016W;DTYPE=G

<b>f<sub>4</sub>(2050) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\omega\omega$	seen	637
$\pi\pi$	$(17.0 \pm 1.5) \%$	1000
$K\bar{K}$	$(6.8^{+3.4}_{-1.8}) \times 10^{-3}$	880
$\eta\eta$	$(2.1 \pm 0.8) \times 10^{-3}$	848
$4\pi^0$	$< 1.2 \%$	964
$a_2(1320)\pi$	seen	567

 **$\phi(2170)$** 

$I^G(J^{PC}) = 0^-(1^{--})$

Mass  $m = 2175 \pm 15$  MeV (S = 1.6)  
 Full width  $\Gamma = 61 \pm 18$  MeV

<b><math>\phi(2170)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$e^+e^-$	seen	1087
$\phi f_0(980)$	seen	427
$K^+ K^- f_0(980) \rightarrow$	seen	-
$K^+ K^- \pi^+ \pi^-$		
$K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^0 \pi^0$	seen	-
$K^{*0} K^\pm \pi^\mp$	not seen	770

 **$f_2(2300)$** 

$I^G(J^{PC}) = 0^+(2^{++})$

Mass  $m = 2297 \pm 28$  MeV  
 Full width  $\Gamma = 149 \pm 40$  MeV

<b><math>f_2(2300)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\phi\phi$	seen	529
$KK$	seen	1037
$\gamma\gamma$	seen	1149

 **$f_2(2340)$** 

$I^G(J^{PC}) = 0^+(2^{++})$

Mass  $m = 2339 \pm 60$  MeV  
 Full width  $\Gamma = 319^{+80}_{-70}$  MeV

<b><math>f_2(2340)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\phi\phi$	seen	573
$\eta\eta$	seen	1033

## STRANGE MESONS ( $S = \pm 1, C = B = 0$ )

$K^+ = u\bar{s}$ ,  $K^0 = d\bar{s}$ ,  $\bar{K}^0 = \bar{d}s$ ,  $K^- = \bar{u}s$ , similarly for  $K^*$ 's

 **$K^*(892)$** 

$I(J^P) = \frac{1}{2}(1^-)$

$K^*(892)^\pm$  mass  $m = 891.66 \pm 0.26$  MeV  
 Mass  $m = 895.5 \pm 0.8$  MeV  
 $K^*(892)^0$  mass  $m = 895.94 \pm 0.22$  MeV (S = 1.4)  
 $K^*(892)^\pm$  full width  $\Gamma = 50.8 \pm 0.9$  MeV  
 Full width  $\Gamma = 46.2 \pm 1.3$  MeV  
 $K^*(892)^0$  full width  $\Gamma = 48.7 \pm 0.8$  MeV (S = 1.7)

NODE=M016215;DESIG=6  
 DESIG=1  
 DESIG=2  
 DESIG=3  
 DESIG=5  
 DESIG=7

NODE=M103

NODE=M103M;DTYPE=M  
 NODE=M103W;DTYPE=G

NODE=M103215;DESIG=1;OUR EVAL;  
 DESIG=2;OUR EVAL; $\leftarrow$  NOT CHECKED  
 DESIG=6  
 DESIG=7  
 DESIG=8

NODE=M107

NODE=M107M;DTYPE=M  
 NODE=M107W;DTYPE=G

NODE=M107215;DESIG=1;OUR EST;  
 DESIG=2;OUR EST; $\leftarrow$  NOT CHECKED  
 DESIG=3;OUR EST; $\rightarrow$  NOT CHECKED

NODE=M108

NODE=M108M;DTYPE=M  
 NODE=M108W;DTYPE=G

NODE=M108215;DESIG=1;OUR EST;  
 DESIG=2;OUR EST; $\leftarrow$  NOT CHECKED

NODE=MXXX020

NODE=M018

NODE=M018M1;DTYPE=M  
 NODE=M018MCT;DTYPE=M  
 NODE=M018M2;DTYPE=M  
 NODE=M018W1;DTYPE=G  
 NODE=M018W5;DTYPE=G  
 NODE=M018W2;DTYPE=G

<b>K*(892) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$K\pi$	$\sim 100$ %		289
$K^0\gamma$	$(2.39 \pm 0.21) \times 10^{-3}$		307
$K^\pm\gamma$	$(9.9 \pm 0.9) \times 10^{-4}$		309
$K\pi\pi$	$< 7 \times 10^{-4}$	95%	223

NODE=M018220;DESIG=1;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=4  
 DESIG=3  
 DESIG=2

**K<sub>1</sub>(1270)**

$$I(J^P) = \frac{1}{2}(1^+)$$

Mass  $m = 1272 \pm 7$  MeV [g]Full width  $\Gamma = 90 \pm 20$  MeV [g]

<b>K<sub>1</sub>(1270) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\rho$	(42 ± 6) %	45
$K_0^*(1430)\pi$	(28 ± 4) %	†
$K^*(892)\pi$	(16 ± 5) %	302
$K\omega$	(11.0 ± 2.0) %	†
$Kf_0(1370)$	(3.0 ± 2.0) %	†
$\gamma K^0$	seen	539

NODE=M028

NODE=M028MX;DTYPE=M

NODE=M028WX;DTYPE=G;OUR EST;  
 → NOT CHECKED ←**K<sub>1</sub>(1400)**

$$I(J^P) = \frac{1}{2}(1^+)$$

Mass  $m = 1403 \pm 7$  MeVFull width  $\Gamma = 174 \pm 13$  MeV (S = 1.6)

<b>K<sub>1</sub>(1400) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K^*(892)\pi$	(94 ± 6) %	402
$K\rho$	(3.0 ± 3.0) %	292
$Kf_0(1370)$	(2.0 ± 2.0) %	†
$K\omega$	(1.0 ± 1.0) %	284
$K_0^*(1430)\pi$	not seen	†
$\gamma K^0$	seen	613

NODE=M064

NODE=M064M;DTYPE=M

NODE=M064W;DTYPE=G

**K<sup>\*</sup>(1410)**

$$I(J^P) = \frac{1}{2}(1^-)$$

Mass  $m = 1414 \pm 15$  MeV (S = 1.3)Full width  $\Gamma = 232 \pm 21$  MeV (S = 1.1)

<b>K<sup>*</sup>(1410) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$K^*(892)\pi$	> 40 %	95%	410
$K\pi$	(6.6 ± 1.3) %		612
$K\rho$	< 7 %	95%	305
$\gamma K^0$	seen		619

NODE=M094

NODE=M094M;DTYPE=M

NODE=M094W;DTYPE=G

**K<sub>0</sub><sup>\*</sup>(1430) [o]**

$$I(J^P) = \frac{1}{2}(0^+)$$

Mass  $m = 1425 \pm 50$  MeVFull width  $\Gamma = 270 \pm 80$  MeV

NODE=M094215;DESIG=2;OUR EST;  
 → NOT CHECKED ←  
 DESIG=1

DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=4;OUR EST;→ NOT CHECKED ←

NODE=M019

NODE=M019M;DTYPE=M;OUR EST;  
 → NOT CHECKED ←NODE=M019W;DTYPE=G;OUR EST;  
 → NOT CHECKED ←

<b><math>K_0^*(1430)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\pi$	(93±10) %	619

NODE=M019215;DESIG=1

 **$K_2^*(1430)$**        $I(J^P) = \frac{1}{2}(2^+)$ 

$K_2^*(1430)^{\pm}$  mass  $m = 1425.6 \pm 1.5$  MeV (S = 1.1)  
 $K_2^*(1430)^0$  mass  $m = 1432.4 \pm 1.3$  MeV  
 $K_2^*(1430)^{\pm}$  full width  $\Gamma = 98.5 \pm 2.7$  MeV (S = 1.1)  
 $K_2^*(1430)^0$  full width  $\Gamma = 109 \pm 5$  MeV (S = 1.9)

<b><math>K_2^*(1430)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$K\pi$	(49.9±1.2) %		619
$K^*(892)\pi$	(24.7±1.5) %		419
$K^*(892)\pi\pi$	(13.4±2.2) %		372
$K\rho$	( 8.7±0.8) %	S=1.2	318
$K\omega$	( 2.9±0.8) %		311
$K^+\gamma$	( 2.4±0.5) × 10 <sup>-3</sup>	S=1.1	627
$K\eta$	( 1.5 <sup>+3.4</sup> <sub>-1.0</sub> ) × 10 <sup>-3</sup>	S=1.3	486
$K\omega\pi$	< 7.2 × 10 <sup>-4</sup>	CL=95%	100
$K^0\gamma$	< 9 × 10 <sup>-4</sup>	CL=90%	626

NODE=M022

NODE=M022M1;DTYPE=M  
NODE=M022M4;DTYPE=M  
NODE=M022W1;DTYPE=G  
NODE=M022W4;DTYPE=G

 **$K^*(1680)$**        $I(J^P) = \frac{1}{2}(1^-)$ 

Mass  $m = 1717 \pm 27$  MeV (S = 1.4)  
Full width  $\Gamma = 322 \pm 110$  MeV (S = 4.2)

<b><math>K^*(1680)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\pi$	(38.7±2.5) %	781
$K\rho$	(31.4 <sup>+5.0</sup> <sub>-2.1</sub> ) %	570
$K^*(892)\pi$	(29.9 <sup>+2.2</sup> <sub>-5.0</sub> ) %	618

NODE=M095

NODE=M095M;DTYPE=M  
NODE=M095W;DTYPE=G

 **$K_2(1770)$  [p]**       $I(J^P) = \frac{1}{2}(2^-)$ 

Mass  $m = 1773 \pm 8$  MeV  
Full width  $\Gamma = 186 \pm 14$  MeV

<b><math>K_2(1770)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\pi\pi$		794
$K_2^*(1430)\pi$	dominant	288
$K^*(892)\pi$	seen	654
$Kf_2(1270)$	seen	55
$K\phi$	seen	441
$K\omega$	seen	607

NODE=M023

NODE=M023M;DTYPE=M  
NODE=M023W;DTYPE=G

 **$K_3^*(1780)$**        $I(J^P) = \frac{1}{2}(3^-)$ 

Mass  $m = 1776 \pm 7$  MeV (S = 1.1)  
Full width  $\Gamma = 159 \pm 21$  MeV (S = 1.3)

NODE=M060

NODE=M060M;DTYPE=M  
NODE=M060W;DTYPE=G

<b><math>K_3^*(1780)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$K\rho$	(31 ± 9) %		613
$K^*(892)\pi$	(20 ± 5) %		656
$K\pi$	(18.8 ± 1.0) %		813
$K\eta$	(30 ± 13) %		719
$K_2^*(1430)\pi$	< 16 %	95%	291

 **$K_2(1820)$  [q]**

$I(J^P) = \frac{1}{2}(2^-)$

Mass  $m = 1816 \pm 13$  MeV  
 Full width  $\Gamma = 276 \pm 35$  MeV

<b><math>K_2(1820)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K_2^*(1430)\pi$	seen	327
$K^*(892)\pi$	seen	681
$Kf_2(1270)$	seen	186
$K\omega$	seen	638

 **$K_4^*(2045)$** 

$I(J^P) = \frac{1}{2}(4^+)$

Mass  $m = 2045 \pm 9$  MeV (S = 1.1)  
 Full width  $\Gamma = 198 \pm 30$  MeV

<b><math>K_4^*(2045)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$K\pi$	(9.9 ± 1.2) %	958
$K^*(892)\pi\pi$	(9 ± 5) %	802
$K^*(892)\pi\pi\pi$	(7 ± 5) %	768
$\rho K\pi$	(5.7 ± 3.2) %	741
$\omega K\pi$	(5.0 ± 3.0) %	738
$\phi K\pi$	(2.8 ± 1.4) %	594
$\phi K^*(892)$	(1.4 ± 0.7) %	363

## CHARMED MESONS (C = ±1)

$D^+ = c\bar{d}$ ,  $D^0 = c\bar{u}$ ,  $\bar{D}^0 = \bar{c}u$ ,  $D^- = \bar{c}d$ , similarly for  $D^*$ 's

 **$D^*(2007)^0$** 

$I(J^P) = \frac{1}{2}(1^-)$

$I$ ,  $J$ ,  $P$  need confirmation.

Mass  $m = 2006.96 \pm 0.16$  MeV  
 $m_{D^{*0}} - m_{D^0} = 142.12 \pm 0.07$  MeV  
 Full width  $\Gamma < 2.1$  MeV, CL = 90%

$\bar{D}^*(2007)^0$  modes are charge conjugates of modes below.

<b><math>D^*(2007)^0</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^0\pi^0$	(61.9 ± 2.9) %	43
$D^0\gamma$	(38.1 ± 2.9) %	137

 **$D^*(2010)^{\pm}$** 

$I(J^P) = \frac{1}{2}(1^{\pm})$

$I$ ,  $J$ ,  $P$  need confirmation.

Mass  $m = 2010.25 \pm 0.14$  MeV  
 $m_{D^*(2010)^+} - m_{D^+} = 140.65 \pm 0.10$  MeV (S = 1.1)  
 $m_{D^*(2010)^+} - m_{D^0} = 145.421 \pm 0.010$  MeV (S = 1.1)  
 Full width  $\Gamma = 96 \pm 22$  keV

NODE=M060215;DESIG=3  
 DESIG=2  
 DESIG=1  
 DESIG=6  
 DESIG=4

NODE=M146

NODE=M146M;DTYPE=M  
 NODE=M146W;DTYPE=G

NODE=M146215;DESIG=1;OUR EVAL;  
 $\overrightarrow{\text{NOT CHECKED}}$  ←  
 DESIG=2;OUR EVAL;→ NOT CHECKED ←  
 DESIG=3;OUR EVAL;→ NOT CHECKED ←  
 DESIG=6;OUR EVAL;→ NOT CHECKED ←

NODE=M035

NODE=M035M;DTYPE=M  
 NODE=M035W;DTYPE=G

NODE=M035215;DESIG=1  
 DESIG=2  
 DESIG=5  
 DESIG=3  
 DESIG=4  
 DESIG=6  
 DESIG=7

NODE=MXXX035

NODE=M061

NODE=M061M;DTYPE=M  
 NODE=M061DM;DTYPE=D  
 NODE=M061W;DTYPE=G  
 NODE=M061220;NODE=M061

DESIG=1  
 DESIG=2

NODE=M062

NODE=M062M;DTYPE=M  
 NODE=M062MD;DTYPE=D  
 NODE=M062DM;DTYPE=D  
 NODE=M062W;DTYPE=G

$D^*(2010)^-$  modes are charge conjugates of the modes below.

NODE=M062225;NODE=M062

<b><math>D^*(2010)^\pm</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^0\pi^+$	( $67.7 \pm 0.5$ ) %	39
$D^+\pi^0$	( $30.7 \pm 0.5$ ) %	38
$D^+\gamma$	( $1.6 \pm 0.4$ ) %	136

### **$D_1(2420)^0$**

$$I(J^P) = \frac{1}{2}(1^+)$$

$I, J, P$  need confirmation.

Mass  $m = 2422.0 \pm 0.6$  MeV

$$m_{D_1^0} - m_{D^{*+}} = 411.7 \pm 0.6$$

Full width  $\Gamma = 20.4 \pm 1.7$  MeV

$\overline{D}_1(2420)^0$  modes are charge conjugates of modes below.

NODE=M097

NODE=M097M;DTYPE=M

NODE=M097DM;DTYPE=D

NODE=M097W;DTYPE=G

NODE=M097215;NODE=M097

<b><math>D_1(2420)^0</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^*(2010)^+\pi^-$	seen	354
$D^0\pi^+\pi^-$	seen	426
$D^+\pi^-$	not seen	473
$D^{*0}\pi^+\pi^-$	not seen	280

### **$D_2^*(2460)^0$**

$$I(J^P) = \frac{1}{2}(2^+)$$

$J^P = 2^+$  assignment strongly favored.

Mass  $m = 2462.8 \pm 1.0$  MeV ( $S = 1.5$ )

$$m_{D_2^{*0}} - m_{D^+} = 593.2 \pm 1.0$$
 MeV ( $S = 1.5$ )

$$m_{D_2^{*0}} - m_{D^{*+}} = 452.6 \pm 1.0$$
 MeV ( $S = 1.5$ )

Full width  $\Gamma = 42.9 \pm 3.1$  MeV ( $S = 1.7$ )

$\overline{D}_2^*(2460)^0$  modes are charge conjugates of modes below.

NODE=M119

NODE=M119M;DTYPE=M

NODE=M119DM;DTYPE=D

NODE=M119DM2;DTYPE=D

NODE=M119W;DTYPE=G

NODE=M119215;NODE=M119

<b><math>D_2^*(2460)^0</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^+\pi^-$	seen	507
$D^*(2010)^+\pi^-$	seen	391
$D^0\pi^+\pi^-$	not seen	464
$D^{*0}\pi^+\pi^-$	not seen	326

### **$D_2^*(2460)^\pm$**

$$I(J^P) = \frac{1}{2}(2^+)$$

$J^P = 2^+$  assignment strongly favored.

Mass  $m = 2460.1^{+2.6}_{-3.5}$  MeV ( $S = 1.5$ )

$$m_{D_2^*(2460)^\pm} - m_{D_2^*(2460)^0} = 2.4 \pm 1.7$$
 MeV

Full width  $\Gamma = 37 \pm 6$  MeV ( $S = 1.4$ )

$D_2^*(2460)^-$  modes are charge conjugates of modes below.

CLUMP=A;DESIG=1

DESIG=2

DESIG=3;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

DESIG=4;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

NODE=M150

NODE=M150M;DTYPE=M

NODE=M150DM;DTYPE=D

NODE=M150W;DTYPE=G

NODE=M150215;NODE=M150

<b><math>D_2^*(2460)^\pm</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^0\pi^+$	seen	508
$D^{*0}\pi^+$	seen	391
$D^+\pi^+\pi^-$	not seen	457
$D^{*+}\pi^+\pi^-$	not seen	320

DESIG=1

DESIG=2;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

DESIG=3;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

DESIG=4;OUR EST; $\rightarrow$  NOT CHECKED  $\leftarrow$

# CHARMED, STRANGE MESONS

( $C = S = \pm 1$ )

$D_s^+ = c\bar{s}$ ,  $D_s^- = \bar{c}s$ , similarly for  $D_s^*$ 's

$D_s^{*\pm}$

$I(J^P) = 0(?)$

$J^P$  is natural, width and decay modes consistent with  $1^-$ .

Mass  $m = 2112.3 \pm 0.5$  MeV ( $S = 1.1$ )

$m_{D_s^{*\pm}} - m_{D_s^\pm} = 143.8 \pm 0.4$  MeV

Full width  $\Gamma < 1.9$  MeV, CL = 90%

$D_s^{*-}$  modes are charge conjugates of the modes below.

NODE=MXXX040

## $D_s^{*+}$ DECAY MODES

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D_s^+ \gamma$	(94.2 $\pm$ 0.7) %	139
$D_s^+ \pi^0$	( 5.8 $\pm$ 0.7) %	48

$D_{s0}^*(2317)^\pm$

$I(J^P) = 0(0^+)$

$J, P$  need confirmation.

$J^P$  is natural, low mass consistent with  $0^+$ .

Mass  $m = 2317.8 \pm 0.6$  MeV ( $S = 1.1$ )

$m_{D_{s0}^*(2317)^\pm} - m_{D_s^\pm} = 349.3 \pm 0.6$  MeV ( $S = 1.1$ )

Full width  $\Gamma < 3.8$  MeV, CL = 95%

$D_{s0}^*(2317)^-$  modes are charge conjugates of modes below.

NODE=S074

NODE=S074M;DTYPE=M

NODE=S074DM;DTYPE=D

NODE=S074W;DTYPE=G

NODE=S074215;NODE=S074

## $D_{s0}^*(2317)^\pm$ DECAY MODES

	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D_s^+ \pi^0$	seen	298
$D_s^+ \pi^0 \pi^0$	not seen	205

$D_{s1}(2460)^\pm$

$I(J^P) = 0(1^+)$

Mass  $m = 2459.5 \pm 0.6$  MeV ( $S = 1.1$ )

$m_{D_{s1}(2460)^\pm} - m_{D_s^{*\pm}} = 347.2 \pm 0.8$  MeV ( $S = 1.2$ )

$m_{D_{s1}(2460)^\pm} - m_{D_s^\pm} = 491.1 \pm 0.7$  MeV ( $S = 1.1$ )

Full width  $\Gamma < 3.5$  MeV, CL = 95%

$D_{s1}(2460)^-$  modes are charge conjugates of the modes below.

NODE=M172

NODE=M172M;DTYPE=M

NODE=M172DM;DTYPE=D

NODE=M172W;DTYPE=G

NODE=M172215;NODE=M172

## $D_{s1}(2460)^+$ DECAY MODES

	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)
$D_s^{*+} \pi^0$	(48 $\pm$ 11 ) %		297
$D_s^+ \gamma$	(18 $\pm$ 4 ) %		442
$D_s^+ \pi^+ \pi^-$	( 4.3 $\pm$ 1.3 ) %	S=1.1	363
$D_s^{*+} \gamma$	< 8 %	CL=90%	323
$D_{s0}^*(2317)^+ \gamma$	( 3.7 $\pm$ 5.0 ) %		138

$D_{s1}(2536)^\pm$

$I(J^P) = 0(1^+)$

$J, P$  need confirmation.

Mass  $m = 2535.29 \pm 0.20$  MeV

Full width  $\Gamma < 2.3$  MeV, CL = 90%

NODE=M173

NODE=M173M;DTYPE=M

NODE=M173MD;DTYPE=D

NODE=M173DM;DTYPE=D

NODE=M173W;DTYPE=G

NODE=M173215;NODE=M173

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

NODE=M121

NODE=M121M;DTYPE=M

NODE=M121W;DTYPE=G

$D_{s1}(2536)^-$  modes are charge conjugates of the modes below.

NODE=M121215;NODE=M121

$D_{s1}(2536)^+$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^*(2010)^+ K^0$	seen	149
$D^*(2007)^0 K^+$	seen	168
$D^+ K^0$	not seen	382
$D^0 K^+$	not seen	391
$D_s^{*+} \gamma$	possibly seen	388
$D_s^+ \pi^+ \pi^-$	seen	437

### $D_{s2}(2573)^\pm$

$$I(J^P) = 0(?)$$

$J^P$  is natural, width and decay modes consistent with  $2^+$ .

Mass  $m = 2572.6 \pm 0.9$  MeV  
Full width  $\Gamma = 20 \pm 5$  MeV ( $S = 1.3$ )

$D_{s2}(2573)^-$  modes are charge conjugates of the modes below.

NODE=M148

NODE=M148M;DTYPE=M

NODE=M148W;DTYPE=G

NODE=M148215;NODE=M148

$D_{s2}(2573)^+$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$D^0 K^+$	seen	435
$D^*(2007)^0 K^+$	not seen	244

## $c\bar{c}$ MESONS

### $\eta_c(1S)$

$$I^G(J^PC) = 0^+(0-+)$$

Mass  $m = 2980.3 \pm 1.2$  MeV ( $S = 1.6$ )  
Full width  $\Gamma = 28.6 \pm 2.2$  MeV ( $S = 2.0$ )

$\eta_c(1S)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
<b>Decays involving hadronic resonances</b>			
$\eta'(958)\pi\pi$	( 4.1 $\pm$ 1.7 ) %		1321
$\rho\rho$	( 2.0 $\pm$ 0.7 ) %		1272
$K^*(892)^0 K^- \pi^+ + \text{c.c.}$	( 2.0 $\pm$ 0.7 ) %		1276
$K^*(892) \bar{K}^*(892)$	( 9.2 $\pm$ 3.4 ) $\times 10^{-3}$		1194
$K^{*0} \bar{K}^{*0} \pi^+ \pi^-$	( 1.1 $\pm$ 0.5 ) %		1071
$\phi K^+ K^-$	( 2.9 $\pm$ 1.4 ) $\times 10^{-3}$		1102
$\phi\phi$	( 2.7 $\pm$ 0.9 ) $\times 10^{-3}$		1087
$\phi 2(\pi^+ \pi^-)$	< 3.5 $\times 10^{-3}$	90%	1249
$a_0(980)\pi$	< 2 %	90%	1325
$a_2(1320)\pi$	< 2 %	90%	1194
$K^*(892) \bar{K}^+ + \text{c.c.}$	< 1.28 %	90%	1308
$f_2(1270)\eta$	< 1.1 %	90%	1143
$\omega\omega$	< 3.1 $\times 10^{-3}$	90%	1268
$\omega\phi$	< 1.7 $\times 10^{-3}$	90%	1183
$f_2(1270)f_2(1270)$	( 7.6 $\pm$ 3.0 ) $\times 10^{-3}$		771
$f_2(1270)f'_2(1525)$	( 10 $\pm$ 5 ) $\times 10^{-3}$		509

NODE=MXXX025

NODE=M026

NODE=M026M;DTYPE=M

NODE=M026W;DTYPE=G

NODE=M026215;NODE=M026;CLUMP=A  
DESIG=24  
DESIG=19  
DESIG=26  
DESIG=18  
DESIG=57  
DESIG=28  
DESIG=17  
DESIG=58  
DESIG=21  
DESIG=22  
DESIG=40  
DESIG=23  
DESIG=20  
DESIG=47  
DESIG=46  
DESIG=59

<b>Decays into stable hadrons</b>			
$K\bar{K}\pi$	( 7.0 ± 1.2 ) %	1379	NODE=M026;CLUMP=B DESIG=14
$\eta\pi\pi$	( 4.9 ± 1.8 ) %	1427	DESIG=16
$\pi^+\pi^-K^+K^-$	( 1.5 ± 0.6 ) %	1343	DESIG=15
$K^+K^-2(\pi^+\pi^-)$	( 7.1 ± 2.9 ) × 10 <sup>-3</sup>	1252	DESIG=55
$2(K^+K^-)$	( 1.5 ± 0.7 ) × 10 <sup>-3</sup>	1053	DESIG=27
$2(\pi^+\pi^-)$	( 1.20 ± 0.30 ) %	1457	DESIG=11
$3(\pi^+\pi^-)$	( 1.5 ± 0.5 ) %	1405	DESIG=56
$p\bar{p}$	( 1.3 ± 0.4 ) × 10 <sup>-3</sup>	1158	DESIG=12
$\Lambda\bar{\Lambda}$	( 1.04 ± 0.31 ) × 10 <sup>-3</sup>	988	DESIG=45
$K\bar{K}\eta$	< 3.1 %	90%	1263 DESIG=25
$\pi^+\pi^-p\bar{p}$	< 1.2 %	90%	1024 DESIG=13
<b>Radiative decays</b>			
$\gamma\gamma$	( 1.8 ± 0.6 ) × 10 <sup>-4</sup>	1490	NODE=M026;CLUMP=C DESIG=31
<b>Charge conjugation (C), Parity (P), Lepton family number (LF) violating modes</b>			
$\pi^+\pi^-$	$P, CP < 6$	$\times 10^{-4}$	90% 1484 DESIG=51
$\pi^0\pi^0$	$P, CP < 4$	$\times 10^{-4}$	90% 1484 DESIG=52
$K^+K^-$	$P, CP < 6$	$\times 10^{-4}$	90% 1406 DESIG=53
$K_S^0 K_S^0$	$P, CP < 3.1$	$\times 10^{-4}$	90% 1405 DESIG=54

**J/ψ(1S)**

$I^G(J^{PC}) = 0^-(1^{--})$

Mass  $m = 3096.916 \pm 0.011$  MeVFull width  $\Gamma = 92.9 \pm 2.8$  keV (S = 1.1) $\Gamma_{ee} = 5.55 \pm 0.14 \pm 0.02$  keV

<b>J/ψ(1S) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
hadrons	(87.7 ± 0.5) %	—	—	NODE=M070215;DESIG=3
virtual $\gamma \rightarrow$ hadrons	(13.50 ± 0.30) %	—	—	DESIG=4
$ggg$	(64.1 ± 1.0) %	—	—	DESIG=249
$\gamma gg$	( 8.8 ± 1.1 ) %	—	—	DESIG=250
$e^+e^-$	( 5.94 ± 0.06 ) %	1548	DESIG=1	
$\mu^+\mu^-$	( 5.93 ± 0.06 ) %	1545	DESIG=2	

**Decays involving hadronic resonances**

$\rho\pi$	( 1.69 ± 0.15 ) %	S=2.4	1448	NODE=M070;CLUMP=A DESIG=20
$\rho^0\pi^0$	( 5.6 ± 0.7 ) × 10 <sup>-3</sup>	—	1448	DESIG=21
$a_2(1320)\rho$	( 1.09 ± 0.22 ) %	—	1123	DESIG=43
$\omega\pi^+\pi^-\pi^-\pi^+$	( 8.5 ± 3.4 ) × 10 <sup>-3</sup>	—	1392	DESIG=26
$\omega\pi^+\pi^-\pi^0$	( 4.0 ± 0.7 ) × 10 <sup>-3</sup>	—	1418	DESIG=211
$\omega\pi^+\pi^-$	( 8.6 ± 0.7 ) × 10 <sup>-3</sup>	S=1.1	1435	DESIG=24
$\omega f_2(1270)$	( 4.3 ± 0.6 ) × 10 <sup>-3</sup>	—	1142	DESIG=28
$K^*(892)^0\bar{K}_2^*(1430)^0 + c.c.$	( 6.0 ± 0.6 ) × 10 <sup>-3</sup>	—	1012	DESIG=48
$K^*(892)^0\bar{K}_2^*(1770)^0 + c.c. \rightarrow$	( 6.9 ± 0.9 ) × 10 <sup>-4</sup>	—	—	DESIG=235
$K^*(892)^0K^-\pi^+ + c.c.$	—	—	—	
$\omega K^*(892)\bar{K} + c.c.$	( 6.1 ± 0.9 ) × 10 <sup>-3</sup>	—	1097	DESIG=102
$K^+\bar{K}^*(892)^- + c.c.$	( 5.12 ± 0.30 ) × 10 <sup>-3</sup>	—	1373	DESIG=121
$K^+\bar{K}^*(892)^- + c.c. \rightarrow$	( 1.97 ± 0.20 ) × 10 <sup>-3</sup>	—	—	DESIG=231
$K^+K^-\pi^0$	—	—	—	
$K^+\bar{K}^*(892)^- + c.c. \rightarrow$	( 3.0 ± 0.4 ) × 10 <sup>-3</sup>	—	—	DESIG=232
$K^0K^\pm\pi^\mp$	—	—	—	
$K^0\bar{K}^*(892)^0 + c.c.$	( 4.39 ± 0.31 ) × 10 <sup>-3</sup>	—	1373	DESIG=122
$K^0\bar{K}^*(892)^0 + c.c. \rightarrow$	( 3.2 ± 0.4 ) × 10 <sup>-3</sup>	—	—	DESIG=233
$K^0K^\pm\pi^\mp$	—	—	—	
$K_1(1400)^\pm K^\mp$	( 3.8 ± 1.4 ) × 10 <sup>-3</sup>	—	1170	DESIG=132
$\bar{K}^*(892)^0K^+\pi^- + c.c.$	seen	—	1343	DESIG=214
$\omega\pi^0\pi^0$	( 3.4 ± 0.8 ) × 10 <sup>-3</sup>	—	1436	DESIG=140
$b_1(1235)^\pm\pi^\mp$	[r] ( 3.0 ± 0.5 ) × 10 <sup>-3</sup>	—	1300	DESIG=49

$\omega K^\pm K_S^0 \pi^\mp$	[r]	( 3.4 ± 0.5 ) × 10 <sup>-3</sup>	1210	DESIG=101	
$b_1(1235)^0 \pi^0$		( 2.3 ± 0.6 ) × 10 <sup>-3</sup>	1300	DESIG=160	
$\eta K^\pm K_S^0 \pi^\mp$	[r]	( 2.2 ± 0.4 ) × 10 <sup>-3</sup>	1278	DESIG=230	
$\phi K^*(892) \bar{K} + \text{c.c.}$		( 2.18 ± 0.23 ) × 10 <sup>-3</sup>	969	DESIG=104	
$\omega K \bar{K}$		( 1.6 ± 0.5 ) × 10 <sup>-4</sup>	1268	DESIG=27	
$\omega f_0(1710) \rightarrow \omega K \bar{K}$		( 4.8 ± 1.1 ) × 10 <sup>-4</sup>	878	DESIG=130	
$\phi 2(\pi^+ \pi^-)$		( 1.66 ± 0.23 ) × 10 <sup>-3</sup>	1318	DESIG=35	
$\Delta(1232)^{++} \bar{p} \pi^-$		( 1.6 ± 0.5 ) × 10 <sup>-3</sup>	1030	DESIG=70	
$\omega \eta$		( 1.74 ± 0.20 ) × 10 <sup>-3</sup>	S=1.6	DESIG=30	
$\phi K \bar{K}$		( 1.83 ± 0.24 ) × 10 <sup>-3</sup>	S=1.5	DESIG=36	
$\phi f_0(1710) \rightarrow \phi K \bar{K}$		( 3.6 ± 0.6 ) × 10 <sup>-4</sup>	875	DESIG=129	
$\Delta(1232)^{++} \bar{\Delta}(1232)^{--}$		( 1.10 ± 0.29 ) × 10 <sup>-3</sup>	938	DESIG=66	
$\Sigma(1385)^- \bar{\Sigma}(1385)^+(\text{or c.c.})$	[r]	( 1.03 ± 0.13 ) × 10 <sup>-3</sup>	697	DESIG=67	
$\phi f'_2(1525)$		( 8 ± 4 ) × 10 <sup>-4</sup>	S=2.7	871	DESIG=40
$\phi \pi^+ \pi^-$		( 9.4 ± 0.9 ) × 10 <sup>-4</sup>	S=1.2	1365	DESIG=34
$\phi \pi^0 \pi^0$		( 5.6 ± 1.6 ) × 10 <sup>-4</sup>	1366	DESIG=76	
$\phi K^\pm K_S^0 \pi^\mp$	[r]	( 7.2 ± 0.8 ) × 10 <sup>-4</sup>	1114	DESIG=103	
$\omega f_1(1420)$		( 6.8 ± 2.4 ) × 10 <sup>-4</sup>	1062	DESIG=105	
$\phi \eta$		( 7.5 ± 0.8 ) × 10 <sup>-4</sup>	S=1.5	1320	DESIG=37
$\Xi^0 \bar{\Xi}^0$		( 1.20 ± 0.24 ) × 10 <sup>-3</sup>	818	DESIG=248	
$\Xi(1530)^- \bar{\Xi}^+$		( 5.9 ± 1.5 ) × 10 <sup>-4</sup>	600	DESIG=107	
$p K^- \bar{\Sigma}(1385)^0$		( 5.1 ± 3.2 ) × 10 <sup>-4</sup>	646	DESIG=74	
$\omega \pi^0$		( 4.5 ± 0.5 ) × 10 <sup>-4</sup>	S=1.4	1446	DESIG=32
$\phi \eta'(958)$		( 4.0 ± 0.7 ) × 10 <sup>-4</sup>	S=2.1	1192	DESIG=38
$\phi f_0(980)$		( 3.2 ± 0.9 ) × 10 <sup>-4</sup>	S=1.9	1182	DESIG=41
$\phi f_0(980) \rightarrow \phi \pi^+ \pi^-$		( 1.8 ± 0.4 ) × 10 <sup>-4</sup>	—	DESIG=236	
$\phi f_0(980) \rightarrow \phi \pi^0 \pi^0$		( 1.7 ± 0.7 ) × 10 <sup>-4</sup>	—	DESIG=237	
$\Xi(1530)^0 \bar{\Xi}^0$		( 3.2 ± 1.4 ) × 10 <sup>-4</sup>	608	DESIG=108	
$\Sigma(1385)^- \bar{\Sigma}^+(\text{or c.c.})$	[r]	( 3.1 ± 0.5 ) × 10 <sup>-4</sup>	855	DESIG=68	
$\phi f_1(1285)$		( 2.6 ± 0.5 ) × 10 <sup>-4</sup>	S=1.1	1032	DESIG=106
$\eta \pi^+ \pi^-$		( 4.0 ± 1.7 ) × 10 <sup>-4</sup>	1487	DESIG=239	
$\rho \eta$		( 1.93 ± 0.23 ) × 10 <sup>-4</sup>	1396	DESIG=22	
$\omega \eta'(958)$		( 1.82 ± 0.21 ) × 10 <sup>-4</sup>	1279	DESIG=31	
$\omega f_0(980)$		( 1.4 ± 0.5 ) × 10 <sup>-4</sup>	1271	DESIG=150	
$\rho \eta'(958)$		( 1.05 ± 0.18 ) × 10 <sup>-4</sup>	1281	DESIG=23	
$a_2(1320)^\pm \pi^\mp$	[r]	< 4.3 × 10 <sup>-3</sup>	CL=90%	1263	DESIG=42
$K K_2^*(1430) + \text{c.c.}$		< 4.0 × 10 <sup>-3</sup>	CL=90%	1159	DESIG=45
$K_1(1270)^\pm K^\mp$		< 3.0 × 10 <sup>-3</sup>	CL=90%	1231	DESIG=131
$K_2^*(1430)^0 \bar{K}_2^*(1430)^0$		< 2.9 × 10 <sup>-3</sup>	CL=90%	604	DESIG=47
$K^*(892)^0 \bar{K}^*(892)^0$		( 2.3 ± 0.7 ) × 10 <sup>-4</sup>	1266	DESIG=46	
$\phi f_2(1270)$		( 7.2 ± 1.3 ) × 10 <sup>-4</sup>	1036	DESIG=39	
$\phi \eta(1405) \rightarrow \phi \eta \pi \pi$		< 2.5 × 10 <sup>-4</sup>	CL=90%	946	DESIG=128
$\omega f'_2(1525)$		< 2.2 × 10 <sup>-4</sup>	CL=90%	1003	DESIG=29
$\Sigma(1385)^0 \bar{\Lambda}$		< 2 × 10 <sup>-4</sup>	CL=90%	912	DESIG=111
$\Delta(1232)^+ \bar{p}$		< 1 × 10 <sup>-4</sup>	CL=90%	1100	DESIG=112
$\Theta(1540) \bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.}$		< 1.1 × 10 <sup>-5</sup>	CL=90%	—	DESIG=205
$\Theta(1540) K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n}$		< 2.1 × 10 <sup>-5</sup>	CL=90%	—	DESIG=206
$\Theta(1540) K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n$		< 1.6 × 10 <sup>-5</sup>	CL=90%	—	DESIG=207
$\bar{\Theta}(1540) K^+ n \rightarrow K_S^0 \bar{p} K^+ n$		< 5.6 × 10 <sup>-5</sup>	CL=90%	—	DESIG=208
$\bar{\Theta}(1540) K_S^0 p \rightarrow K_S^0 p K^- \bar{n}$		< 1.1 × 10 <sup>-5</sup>	CL=90%	—	DESIG=209
$\Sigma^0 \bar{\Lambda}$		< 9 × 10 <sup>-5</sup>	CL=90%	1032	DESIG=110
$\phi \pi^0$		< 6.4 × 10 <sup>-6</sup>	CL=90%	1377	DESIG=33

**Decays into stable hadrons**

$2(\pi^+\pi^-)\pi^0$	( 4.1 ± 0.5 ) %	S=2.4	1496	NODE=M070;CLUMP=B DESIG=9
$3(\pi^+\pi^-)\pi^0$	( 2.9 ± 0.6 ) %		1433	DESIG=11
$\pi^+\pi^-\pi^0$	( 2.07 ± 0.12 ) %	S=1.6	1533	DESIG=7
$\pi^+\pi^-\pi^0K^+K^-$	( 1.79 ± 0.29 ) %	S=2.2	1368	DESIG=18
$4(\pi^+\pi^-)\pi^0$	( 9.0 ± 3.0 ) × 10 <sup>-3</sup>		1345	DESIG=12
$\pi^+\pi^-K^+K^-$	( 6.6 ± 0.5 ) × 10 <sup>-3</sup>		1407	DESIG=16
$\pi^+\pi^-K^+K^-\eta$	( 1.84 ± 0.28 ) × 10 <sup>-3</sup>		1221	DESIG=238
$\pi^0\pi^0K^+K^-$	( 2.45 ± 0.31 ) × 10 <sup>-3</sup>		1410	DESIG=234
$\eta\phi f_0(980) \rightarrow \eta\phi\pi^+\pi^-$	( 3.2 ± 1.0 ) × 10 <sup>-4</sup>		—	DESIG=229
$K\bar{K}\pi$	( 6.1 ± 1.0 ) × 10 <sup>-3</sup>		1442	DESIG=15
$2(\pi^+\pi^-)$	( 3.55 ± 0.23 ) × 10 <sup>-3</sup>		1517	DESIG=8
$3(\pi^+\pi^-)$	( 4.3 ± 0.4 ) × 10 <sup>-3</sup>		1466	DESIG=10
$2(\pi^+\pi^-\pi^0)$	( 1.62 ± 0.21 ) %		1468	DESIG=210
$2(\pi^+\pi^-)\eta$	( 2.29 ± 0.24 ) × 10 <sup>-3</sup>		1446	DESIG=201
$3(\pi^+\pi^-)\eta$	( 7.2 ± 1.5 ) × 10 <sup>-4</sup>		1379	DESIG=202
$p\bar{p}$	( 2.17 ± 0.07 ) × 10 <sup>-3</sup>		1232	DESIG=50
$p\bar{p}\pi^0$	( 1.19 ± 0.08 ) × 10 <sup>-3</sup>	S=1.1	1176	DESIG=52
$p\bar{p}\pi^+\pi^-$	( 6.0 ± 0.5 ) × 10 <sup>-3</sup>	S=1.3	1107	DESIG=54
$p\bar{p}\pi^+\pi^-\pi^0$	[s] ( 2.3 ± 0.9 ) × 10 <sup>-3</sup>	S=1.9	1033	DESIG=55
$p\bar{p}\eta$	( 2.00 ± 0.12 ) × 10 <sup>-3</sup>		948	DESIG=56
$p\bar{p}\rho$	< 3.1 × 10 <sup>-4</sup>	CL=90%	774	DESIG=57
$p\bar{p}\omega$	( 1.10 ± 0.15 ) × 10 <sup>-3</sup>	S=1.3	768	DESIG=58
$p\bar{p}\eta'(958)$	( 1.3 ± 0.4 ) × 10 <sup>-3</sup>	S=2.1	596	DESIG=59
$p\bar{p}\phi$	( 4.5 ± 1.5 ) × 10 <sup>-5</sup>		527	DESIG=127
$n\bar{n}$	( 2.2 ± 0.4 ) × 10 <sup>-3</sup>		1231	DESIG=64
$n\bar{n}\pi^+\pi^-$	( 4 ± 4 ) × 10 <sup>-3</sup>		1106	DESIG=65
$\Sigma^+\bar{\Sigma}^-$	( 1.50 ± 0.24 ) × 10 <sup>-3</sup>		992	DESIG=247
$\Sigma^0\bar{\Sigma}^0$	( 1.29 ± 0.09 ) × 10 <sup>-3</sup>		988	DESIG=63
$2(\pi^+\pi^-)K^+K^-$	( 4.7 ± 0.7 ) × 10 <sup>-3</sup>	S=1.3	1320	DESIG=17
$p\bar{n}\pi^-$	( 2.12 ± 0.09 ) × 10 <sup>-3</sup>		1174	DESIG=53
$nN(1440)$	seen		978	DESIG=215;OUR EST; NOT CHECKED ←
$nN(1520)$	seen		924	DESIG=216;OUR EST; NOT CHECKED ←
$nN(1535)$	seen		914	DESIG=217;OUR EST; NOT CHECKED ←
$\Xi^-\bar{\Xi}^+$	( 8.5 ± 1.6 ) × 10 <sup>-4</sup>	S=1.5	807	DESIG=62
$\Lambda\bar{\Lambda}$	( 1.61 ± 0.15 ) × 10 <sup>-3</sup>	S=1.9	1074	DESIG=60
$\Lambda\bar{\Sigma}^-\pi^+ (\text{or c.c.})$	[r] ( 8.3 ± 0.7 ) × 10 <sup>-4</sup>	S=1.2	950	DESIG=71
$pK^-\bar{\Lambda}$	( 8.9 ± 1.6 ) × 10 <sup>-4</sup>		876	DESIG=72
$2(K^+K^-)$	( 7.6 ± 0.9 ) × 10 <sup>-4</sup>		1131	DESIG=19
$pK^-\bar{\Sigma}^0$	( 2.9 ± 0.8 ) × 10 <sup>-4</sup>		819	DESIG=73
$K^+K^-$	( 2.37 ± 0.31 ) × 10 <sup>-4</sup>		1468	DESIG=13
$K_S^0 K_L^0$	( 1.46 ± 0.26 ) × 10 <sup>-4</sup>	S=2.7	1466	DESIG=75
$\Lambda\bar{\Lambda}\eta$	( 2.6 ± 0.7 ) × 10 <sup>-4</sup>		672	DESIG=228
$\Lambda\bar{\Lambda}\pi^0$	< 6.4 × 10 <sup>-5</sup>	CL=90%	998	DESIG=109
$\bar{\Lambda}nK_S^0 + \text{c.c.}$	( 6.5 ± 1.1 ) × 10 <sup>-4</sup>		872	DESIG=225
$\pi^+\pi^-$	( 1.47 ± 0.23 ) × 10 <sup>-4</sup>		1542	DESIG=6
$\Lambda\bar{\Sigma}^+ \text{c.c.}$	< 1.5 × 10 <sup>-4</sup>	CL=90%	1034	DESIG=61
$K_S^0 K_S^0$	< 1 × 10 <sup>-6</sup>	CL=95%	1466	DESIG=14

**Radiative decays**

$3\gamma$	( 1.2 ± 0.4 ) × 10 <sup>-5</sup>		1548	NODE=M070;CLUMP=C DESIG=81
$4\gamma$	< 9 × 10 <sup>-6</sup>	CL=90%	1548	DESIG=244
$5\gamma$	< 1.5 × 10 <sup>-5</sup>	CL=90%	1548	DESIG=245
$\gamma\eta_c(1S)$	( 1.7 ± 0.4 ) %	S=1.6	114	DESIG=85
$\gamma\eta_c(1S) \rightarrow 3\gamma$	( 1.2 ± 2.7 ) × 10 <sup>-6</sup>		—	DESIG=246
$\gamma\pi^+\pi^-2\pi^0$	( 8.3 ± 3.1 ) × 10 <sup>-3</sup>		1518	DESIG=99
$\gamma\eta\pi\pi$	( 6.1 ± 1.0 ) × 10 <sup>-3</sup>		1487	DESIG=96
$\gamma\eta_2(1870) \rightarrow \gamma\eta\pi^+\pi^-$	( 6.2 ± 2.4 ) × 10 <sup>-4</sup>		—	DESIG=142
$\gamma\eta(1405/1475) \rightarrow \gamma K\bar{K}\pi$	[i] ( 2.8 ± 0.6 ) × 10 <sup>-3</sup>	S=1.6	1223	DESIG=89
$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\rho^0$	( 7.8 ± 2.0 ) × 10 <sup>-5</sup>	S=1.8	1223	DESIG=171
$\gamma\eta(1405/1475) \rightarrow \gamma\eta\pi^+\pi^-$	( 3.0 ± 0.5 ) × 10 <sup>-4</sup>		—	DESIG=170
$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\phi$	< 8.2 × 10 <sup>-5</sup>	CL=95%	—	DESIG=212

$\gamma\rho\rho$	( 4.5 ± 0.8 ) × 10 <sup>-3</sup>	1340	DESIG=94	
$\gamma\rho\omega$	< 5.4 × 10 <sup>-4</sup>	CL=90%	1338	DESIG=226
$\gamma\rho\phi$	< 8.8 × 10 <sup>-5</sup>	CL=90%	1258	DESIG=227
$\gamma\eta/(958)$	( 5.08±0.17) × 10 <sup>-3</sup>	S=1.2	1400	DESIG=84
$\gamma 2\pi^+ 2\pi^-$	( 2.8 ± 0.5 ) × 10 <sup>-3</sup>	S=1.9	1517	DESIG=95
$\gamma f_2(1270) f_2(1270)$	( 9.5 ± 1.7 ) × 10 <sup>-4</sup>		879	DESIG=203
$\gamma f_2(1270) f_2(1270)$ (non resonant)	( 8.2 ± 1.9 ) × 10 <sup>-4</sup>		—	DESIG=204
$\gamma K^+ K^- \pi^+ \pi^-$	( 2.1 ± 0.6 ) × 10 <sup>-3</sup>		1407	DESIG=143
$\gamma f_4(2050)$	( 2.7 ± 0.7 ) × 10 <sup>-3</sup>		891	DESIG=100
$\gamma\omega\omega$	( 1.61±0.33) × 10 <sup>-3</sup>		1336	DESIG=97
$\gamma\eta(1405/1475) \rightarrow \gamma\rho^0\rho^0$	( 1.7 ± 0.4 ) × 10 <sup>-3</sup>	S=1.3	1223	DESIG=124
$\gamma f_2(1270)$	( 1.43±0.11) × 10 <sup>-3</sup>		1286	DESIG=86
$\gamma f_0(1710) \rightarrow \gamma K\bar{K}$	( 8.5 ± 1.2 ) × 10 <sup>-4</sup>	S=1.2	1075	DESIG=91
$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	( 4.0 ± 1.0 ) × 10 <sup>-4</sup>		—	DESIG=135
$\gamma f_0(1710) \rightarrow \gamma\omega\omega$	( 3.1 ± 1.0 ) × 10 <sup>-4</sup>		—	DESIG=221
$\gamma\eta$	( 1.07±0.05) × 10 <sup>-3</sup>	S=1.8	1500	DESIG=83
$\gamma f_1(1420) \rightarrow \gamma K\bar{K}\pi$	( 7.9 ± 1.3 ) × 10 <sup>-4</sup>		1220	DESIG=175
$\gamma f_1(1285)$	( 6.1 ± 0.8 ) × 10 <sup>-4</sup>		1283	DESIG=88
$\gamma f_1(1510) \rightarrow \gamma\eta\pi^+\pi^-$	( 4.5 ± 1.2 ) × 10 <sup>-4</sup>		—	DESIG=141
$\gamma f'_2(1525)$	( 4.5 ± 0.7 ) × 10 <sup>-4</sup>		1173	DESIG=87
$\gamma f_2(1640) \rightarrow \gamma\omega\omega$	( 2.8 ± 1.8 ) × 10 <sup>-4</sup>		—	DESIG=222
$\gamma f_2(1910) \rightarrow \gamma\omega\omega$	( 2.0 ± 1.4 ) × 10 <sup>-4</sup>		—	DESIG=223
$\gamma f_2(1950) \rightarrow$	( 7.0 ± 2.2 ) × 10 <sup>-4</sup>		—	DESIG=144
$\gamma K^*(892)\bar{K}^*(892)$	( 4.0 ± 1.3 ) × 10 <sup>-3</sup>		1266	DESIG=145
$\gamma K^*(892)\bar{K}^*(892)$	( 4.0 ± 1.2 ) × 10 <sup>-4</sup>	S=2.1	1166	DESIG=98
$\gamma\phi\phi$	( 3.8 ± 1.0 ) × 10 <sup>-4</sup>		1232	DESIG=90
$\gamma p\bar{p}$	( 3.3 ± 0.5 ) × 10 <sup>-4</sup>		749	DESIG=126
$\gamma\eta(2225)$	( 1.3 ± 0.9 ) × 10 <sup>-4</sup>		1048	DESIG=125
$\gamma\eta(1760) \rightarrow \gamma\rho^0\rho^0$	( 1.98±0.33) × 10 <sup>-3</sup>		—	DESIG=224
$\gamma\eta(1760) \rightarrow \gamma\omega\omega$	( 2.2 ± 0.6 ) × 10 <sup>-4</sup>		1006	DESIG=213
$\gamma X(1835)$	( 7 ± 4 ) × 10 <sup>-4</sup>	S=2.1	1442	DESIG=176
$\gamma(K\bar{K}\pi) [J^{PC} = 0 - +]$	( 3.51±0.30) × 10 <sup>-5</sup>		1546	DESIG=82
$\gamma\pi^0$	< 7.9 × 10 <sup>-4</sup>	CL=90%	1107	DESIG=93
$\gamma p\bar{p}\pi^+\pi^-$	< 1.3 × 10 <sup>-4</sup>	CL=90%	1074	DESIG=200
$\gamma\Lambda\bar{\Lambda}$	> 2.50 × 10 <sup>-3</sup>	CL=99.9%	745	DESIG=92
$\gamma f_J(2220) \rightarrow \gamma\pi\pi$	( 8 ± 4 ) × 10 <sup>-5</sup>		—	DESIG=136
$\gamma f_J(2220) \rightarrow \gamma K\bar{K}$	( 8.1 ± 3.0 ) × 10 <sup>-5</sup>		—	DESIG=137
$\gamma f_J(2220) \rightarrow \gamma p\bar{p}$	( 1.5 ± 0.8 ) × 10 <sup>-5</sup>		—	DESIG=138
$\gamma f_0(1500)$	> ( 5.7 ± 0.8 ) × 10 <sup>-4</sup>		1183	DESIG=172; OUR EST;
$\gamma e^+ e^-$	( 8.8 ± 1.4 ) × 10 <sup>-3</sup>		1548	DESIG=5; NOT CHECKED ←

**Weak decays**

$D^- e^+ \nu_e + \text{c.c.}$	< 1.2 × 10 <sup>-5</sup>	CL=90%	984	NODE=M070; CLUMP=E
$\overline{D}^0 e^+ e^- + \text{c.c.}$	< 1.1 × 10 <sup>-5</sup>	CL=90%	987	DESIG=218
$D_s^- e^+ \nu_e + \text{c.c.}$	< 3.6 × 10 <sup>-5</sup>	CL=90%	923	DESIG=219
$D_s^- \pi^+ + \text{c.c.}$	< 7.5 × 10 <sup>-5</sup>	CL=90%	977	DESIG=220
$\overline{D}^0 \bar{K}^0 + \text{c.c.}$	< 1.7 × 10 <sup>-4</sup>	CL=90%	898	DESIG=241
$D_s^- \pi^+ + \text{c.c.}$	< 1.3 × 10 <sup>-4</sup>	CL=90%	915	DESIG=242
				DESIG=243

**Charge conjugation (C), Parity (P), Lepton Family number (LF) violating modes**

$\gamma\gamma$	C	< 5 × 10 <sup>-6</sup>	CL=90%	1548	NODE=M070; CLUMP=D
$e^\pm \mu^\mp$	LF	< 1.1 × 10 <sup>-6</sup>	CL=90%	1547	DESIG=80
$e^\pm \tau^\mp$	LF	< 8.3 × 10 <sup>-6</sup>	CL=90%	1039	DESIG=177
$\mu^\pm \tau^\mp$	LF	< 2.0 × 10 <sup>-6</sup>	CL=90%	1035	DESIG=178

**Other decays**

invisible		< 7 × 10 <sup>-4</sup>	CL=90%	—	NODE=M070; CLUMP=F
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 **$\chi_{c0}(1P)$** 

$I^G(J^{PC}) = 0^+(0^{++})$

Mass  $m = 3414.75 \pm 0.31$  MeV  
Full width  $\Gamma = 10.3 \pm 0.6$  MeV

NODE=M056

NODE=M056M; DTTYPE=M

NODE=M056W; DTTYPE=G

<b><math>\chi_{c0}(1P)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
<b>Hadronic decays</b>				
$2(\pi^+\pi^-)$	$(2.27 \pm 0.19) \%$	1679	NODE=M056215; NODE=M056; CLUMP=A	
$\rho^0\pi^+\pi^-$	$(8.9 \pm 2.8) \times 10^{-3}$	1607	DESIG=3	
$f_0(980)f_0(980)$	$(6.8 \pm 2.2) \times 10^{-4}$	1398	DESIG=9	
$\pi^+\pi^-\pi^0\pi^0$	$(3.4 \pm 0.4) \%$	1680	DESIG=20	
$\rho^+\pi^-\pi^0 + \text{c.c.}$	$(2.9 \pm 0.4) \%$	1607	DESIG=61	
$\pi^+\pi^-K^+K^-$	$(1.80 \pm 0.15) \%$	1580	DESIG=62	
$K_0^*(1430)^0\bar{K}_0^*(1430)^0 \rightarrow \pi^+\pi^-K^+K^-$	$(1.00 \pm 0.40) \times 10^{-3}$	—	DESIG=5	
$K_0^*(1430)^0\bar{K}_2^*(1430)^0 + \text{c.c.} \rightarrow \pi^+\pi^-K^+K^-$	$(8.1 \pm 2.0) \times 10^{-4}$	—	DESIG=31	
$K_1(1270)^+K^- + \text{c.c.} \rightarrow \pi^+\pi^-K^+K^-$	$(6.4 \pm 1.9) \times 10^{-3}$	—	DESIG=32	
$K_1(1400)^+K^- + \text{c.c.} \rightarrow \pi^+\pi^-K^+K^-$	$< 2.7 \times 10^{-3}$	CL=90%	DESIG=33	
$f_0(980)f_0(980)$	$(1.7 \pm 1.1) \times 10^{-4}$	1398	DESIG=23	
$f_0(980)f_0(2200)$	$(8.1 \pm 2.1) \times 10^{-4}$	595	DESIG=24	
$f_0(1370)f_0(1370)$	$< 2.8 \times 10^{-4}$	CL=90%	1019	DESIG=25
$f_0(1370)f_0(1500)$	$< 1.7 \times 10^{-4}$	CL=90%	920	DESIG=26
$f_0(1370)f_0(1710)$	$(6.8 \pm 4.0) \times 10^{-4}$	723	DESIG=27	
$f_0(1500)f_0(1370)$	$< 1.3 \times 10^{-4}$	CL=90%	920	DESIG=28
$f_0(1500)f_0(1500)$	$< 5 \times 10^{-5}$	CL=90%	805	DESIG=29
$f_0(1500)f_0(1710)$	$< 7 \times 10^{-5}$	CL=90%	559	DESIG=30
$K^+K^-\pi^0\pi^0$	$(5.7 \pm 0.9) \times 10^{-3}$	1582	DESIG=63	
$K^+\pi^-K^0\pi^0 + \text{c.c.}$	$(2.53 \pm 0.34) \%$	1581	DESIG=65	
$\rho^+K^-K^0 + \text{c.c.}$	$(1.23 \pm 0.22) \%$	1458	DESIG=66	
$K^*(892)^-K^+\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.}$	$(4.7 \pm 1.2) \times 10^{-3}$	—	DESIG=67	
$K_S^0K_S^0\pi^+\pi^-$	$(5.8 \pm 1.1) \times 10^{-3}$	1579	DESIG=41	
$K^+K^-\eta\pi^0$	$(3.1 \pm 0.7) \times 10^{-3}$	1468	DESIG=68	
$3(\pi^+\pi^-)$	$(1.20 \pm 0.18) \%$	1633	DESIG=4	
$K^+\bar{K}^*(892)^0\pi^- + \text{c.c.}$	$(7.3 \pm 1.6) \times 10^{-3}$	1523	DESIG=10	
$K^*(892)^0\bar{K}^*(892)^0$	$(1.7 \pm 0.6) \times 10^{-3}$	1456	DESIG=21	
$\pi\pi$	$(8.4 \pm 0.4) \times 10^{-3}$	1702	DESIG=18	
$\pi^0\eta$	$< 1.8 \times 10^{-4}$	1661	DESIG=35	
$\pi^0\eta'$	$< 1.1 \times 10^{-3}$	1570	DESIG=36	
$\eta\eta$	$(2.68 \pm 0.28) \times 10^{-3}$	1617	DESIG=13	
$\eta\eta'$	$< 2.4 \times 10^{-4}$	CL=90%	1521	DESIG=37
$\eta'\eta'$	$(2.03 \pm 0.22) \times 10^{-3}$	1413	DESIG=46	
$\omega\omega$	$(2.2 \pm 0.7) \times 10^{-3}$	1517	DESIG=22	
$K^+K^-$	$(6.10 \pm 0.35) \times 10^{-3}$	1634	DESIG=2	
$K_S^0K_S^0$	$(3.16 \pm 0.18) \times 10^{-3}$	1633	DESIG=15	
$\pi^+\pi^-\eta$	$< 2.0 \times 10^{-4}$	CL=90%	1651	DESIG=50
$\pi^+\pi^-\eta'$	$< 4 \times 10^{-4}$	CL=90%	1560	DESIG=53
$\bar{K}^0K^+\pi^- + \text{c.c.}$	$< 1.0 \times 10^{-4}$	CL=90%	1610	DESIG=17
$K^+K^-\pi^0$	$< 6 \times 10^{-5}$	CL=90%	1611	DESIG=47
$K^+K^-\eta$	$< 2.3 \times 10^{-4}$	CL=90%	1512	DESIG=51
$K^+K^-K_S^0K_S^0$	$(1.4 \pm 0.5) \times 10^{-3}$	1331	DESIG=42	
$K^+K^-K^+K^-$	$(2.81 \pm 0.30) \times 10^{-3}$	1333	DESIG=14	
$K^+K^-\phi$	$(9.9 \pm 2.5) \times 10^{-4}$	1381	DESIG=44	
$\phi\phi$	$(9.2 \pm 1.9) \times 10^{-4}$	1370	DESIG=16	
$p\bar{p}$	$(2.28 \pm 0.13) \times 10^{-4}$	1426	DESIG=11	
$p\bar{p}\pi^0$	$(5.7 \pm 1.2) \times 10^{-4}$	1379	DESIG=48	

$p\bar{p}\eta$	$(3.7 \pm 1.1) \times 10^{-4}$	1187	DESIG=52
$\pi^+\pi^- p\bar{p}$	$(2.1 \pm 0.7) \times 10^{-3}$	S=1.4	DESIG=8
$\pi^0\pi^0 p\bar{p}$	$(1.05 \pm 0.28) \times 10^{-3}$		DESIG=64
$K_S^0 K_S^0 p\bar{p}$	$< 8.8 \times 10^{-4}$	CL=90%	884
$p\bar{n}\pi^-$	$(1.14 \pm 0.31) \times 10^{-3}$		DESIG=43
$\Lambda\bar{\Lambda}$	$(3.3 \pm 0.4) \times 10^{-4}$		DESIG=19
$\Lambda\bar{\Lambda}\pi^+\pi^-$	$< 4.0 \times 10^{-3}$	CL=90%	1153
$K^+\bar{p}\Lambda + \text{c.c.}$	$(1.03 \pm 0.20) \times 10^{-3}$		DESIG=49
$\Sigma^0\bar{\Sigma}^0$	$(4.2 \pm 0.7) \times 10^{-4}$		DESIG=58
$\Sigma^+\bar{\Sigma}^-$	$(3.1 \pm 0.7) \times 10^{-4}$		DESIG=59
$\Xi^0\bar{\Xi}^0$	$(3.2 \pm 0.8) \times 10^{-4}$		DESIG=60
$\Xi^-\bar{\Xi}^+$	$(4.9 \pm 0.7) \times 10^{-4}$		DESIG=39

**Radiative decays**

$\gamma J/\psi(1S)$	$(1.16 \pm 0.08) \%$	303	NODE=M056;CLUMP=B
$\gamma\rho^0$	$< 9 \times 10^{-6}$	CL=90%	1619
$\gamma\omega$	$< 8 \times 10^{-6}$	CL=90%	1618
$\gamma\phi$	$< 6 \times 10^{-6}$	CL=90%	1555
$\gamma\gamma$	$(2.22 \pm 0.17) \times 10^{-4}$		DESIG=7

 **$\chi_{c1}(1P)$**  $I^G(J^{PC}) = 0^+(1^{++})$ Mass  $m = 3510.66 \pm 0.07$  MeV (S = 1.5)Full width  $\Gamma = 0.86 \pm 0.05$  MeV

<b><math>\chi_{c1}(1P)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$\rho$ (MeV/c)	
<b>Hadronic decays</b>				
$3(\pi^+\pi^-)$	$(5.8 \pm 1.4) \times 10^{-3}$	S=1.2	1683	NODE=M055215;NODE=M055;CLUMP=A
$2(\pi^+\pi^-)$	$(7.6 \pm 2.6) \times 10^{-3}$		1728	DESIG=6
$\pi^+\pi^-\pi^0\pi^0$	$(1.26 \pm 0.17) \%$		1729	DESIG=5
$\rho^+\pi^-\pi^0 + \text{c.c.}$	$(1.53 \pm 0.26) \%$		1658	DESIG=51
$\rho^0\pi^+\pi^-$	$(3.9 \pm 3.5) \times 10^{-3}$		1657	DESIG=52
$\pi^+\pi^-K^+K^-$	$(4.5 \pm 1.0) \times 10^{-3}$		1632	DESIG=9
$K^+K^-\pi^0\pi^0$	$(1.18 \pm 0.29) \times 10^{-3}$		1634	DESIG=53
$K^+\pi^-K^0\pi^0 + \text{c.c.}$	$(9.0 \pm 1.5) \times 10^{-3}$		1632	DESIG=55
$\rho^+K^-K^0 + \text{c.c.}$	$(5.3 \pm 1.3) \times 10^{-3}$		1514	DESIG=56
$K^*(892)^0 K^0\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.}$	$(2.5 \pm 0.7) \times 10^{-3}$		—	DESIG=57
$K^+K^-\eta\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$		1523	DESIG=58
$\pi^+\pi^-K_S^0 K_S^0$	$(7.2 \pm 3.1) \times 10^{-4}$		1630	DESIG=28
$K^+K^-\eta$	$(3.3 \pm 1.0) \times 10^{-4}$		1566	DESIG=42
$K^0K^+\pi^- + \text{c.c.}$	$(7.3 \pm 0.6) \times 10^{-3}$		1661	DESIG=17
$K^*(892)^0\bar{K}^0 + \text{c.c.}$	$(1.0 \pm 0.4) \times 10^{-3}$		1602	DESIG=32
$K^*(892)^+K^- + \text{c.c.}$	$(1.5 \pm 0.7) \times 10^{-3}$		1602	DESIG=33
$K_J^*(1430)^0\bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+\pi^- + \text{c.c.}$	$< 8 \times 10^{-4}$	CL=90%	—	DESIG=34
$K_J^*(1430)^+K^- + \text{c.c.} \rightarrow K_S^0 K^+\pi^- + \text{c.c.}$	$< 2.3 \times 10^{-3}$	CL=90%	—	DESIG=35
$K^+K^-\pi^0$	$(1.91 \pm 0.26) \times 10^{-3}$		1662	DESIG=36
$\eta\pi^+\pi^-$	$(5.0 \pm 0.5) \times 10^{-3}$		1701	DESIG=31
$a_0(980)^+\pi^- + \text{c.c.} \rightarrow \eta\pi^+\pi^-$	$(1.9 \pm 0.7) \times 10^{-3}$		—	DESIG=37
$f_2(1270)\eta$	$(2.8 \pm 0.8) \times 10^{-3}$		1468	DESIG=44
$\pi^+\pi^-\eta'$	$(2.4 \pm 0.5) \times 10^{-3}$		1612	DESIG=10
$K^+\bar{K}^*(892)^0\pi^- + \text{c.c.}$	$(3.2 \pm 2.1) \times 10^{-3}$		1577	DESIG=21
$K^*(892)^0\bar{K}^*(892)^0$	$(1.5 \pm 0.4) \times 10^{-3}$		1512	

$K^+ K^- K_S^0 K_S^0$	$< 5 \times 10^{-4}$	CL=90%	1390	DESIG=29
$K^+ K^- K^+ K^-$	$( 5.6 \pm 1.2 ) \times 10^{-4}$		1393	DESIG=14
$K^+ K^- \phi$	$( 4.3 \pm 1.6 ) \times 10^{-4}$		1440	DESIG=30
$p\bar{p}$	$( 7.3 \pm 0.4 ) \times 10^{-5}$		1484	DESIG=11
$p\bar{p}\pi^0$	$( 1.2 \pm 0.5 ) \times 10^{-4}$		1438	DESIG=39
$p\bar{p}\eta$	$< 1.6 \times 10^{-4}$	CL=90%	1254	DESIG=43
$\pi^+ \pi^- p\bar{p}$	$( 5.0 \pm 1.9 ) \times 10^{-4}$		1381	DESIG=8
$K_S^0 K_S^0 p\bar{p}$	$< 4.5 \times 10^{-4}$	CL=90%	968	DESIG=25
$\Lambda\bar{\Lambda}$	$( 1.18 \pm 0.19 ) \times 10^{-4}$		1355	DESIG=19
$\Lambda\bar{\Lambda}\pi^+\pi^-$	$< 1.5 \times 10^{-3}$	CL=90%	1223	DESIG=24
$K^+ \bar{p}\Lambda$	$( 3.2 \pm 1.0 ) \times 10^{-4}$		1203	DESIG=40
$\Sigma^0 \bar{\Sigma}^0$	$< 4 \times 10^{-5}$	CL=90%	1288	DESIG=48
$\Sigma^+ \bar{\Sigma}^-$	$< 6 \times 10^{-5}$	CL=90%	1291	DESIG=49
$\Xi^0 \bar{\Xi}^0$	$< 6 \times 10^{-5}$	CL=90%	1163	DESIG=50
$\Xi^- \bar{\Xi}^+$	$( 8.4 \pm 2.3 ) \times 10^{-5}$		1155	DESIG=26
$\pi^+ \pi^- + K^+ K^-$	$< 2.1 \times 10^{-3}$		—	DESIG=23
$K_S^0 K_S^0$	$< 6 \times 10^{-5}$	CL=90%	1683	DESIG=27
<b>Radiative decays</b>				
$\gamma J/\psi(1S)$	$( 34.4 \pm 1.5 ) \%$		389	NODE=M055;CLUMP=B
$\gamma \rho^0$	$( 2.29 \pm 0.27 ) \times 10^{-4}$		1670	DESIG=1
$\gamma \omega$	$( 7.8 \pm 1.8 ) \times 10^{-5}$		1668	DESIG=45
$\gamma \phi$	$< 2.4 \times 10^{-5}$	CL=90%	1607	DESIG=46
				DESIG=47

 **$h_c(1P)$**  $I^G(J^{PC}) = ?^?(1^{+-})$ Mass  $m = 3525.42 \pm 0.29$  MeV (S = 1.7)Full width  $\Gamma < 1$  MeV

NODE=M144

NODE=M144M;DTYPE=M

NODE=M144W;DTYPE=G

 **$h_c(1P)$  DECAY MODES**Fraction ( $\Gamma_i/\Gamma$ ) $p$  (MeV/c)

$J/\psi(1S)\pi\pi$	not seen	312	NODE=M144215;DESIG=2;OUR EST; NOT CHECKED ←
$\eta_c \gamma$	seen	503	DESIG=4
$\pi^+ \pi^- \pi^0$	not seen	1749	DESIG=5
$2\pi^+ 2\pi^- \pi^0$	seen	1716	DESIG=6
$3\pi^+ 3\pi^- \pi^0$	not seen	1661	DESIG=7

 **$\chi_{c2}(1P)$**  $I^G(J^{PC}) = 0^+(2^{++})$ Mass  $m = 3556.20 \pm 0.09$  MeVFull width  $\Gamma = 1.97 \pm 0.11$  MeV

NODE=M057

NODE=M057M;DTYPE=M

NODE=M057W;DTYPE=G

$x_{c2}(1P)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
<b>Hadronic decays</b>				
$2(\pi^+\pi^-)$	( 1.1±0.11 ) %	1751	NODE=M057215;NODE=M057;CLUMP=A DESIG=3	
$\pi^+\pi^-\pi^0\pi^0$	( 2.00±0.26 ) %	1752	DESIG=50	
$\rho^+\pi^-\pi^0+$ c.c.	( 2.4 ±0.4 ) %	1682	DESIG=51	
$K^+K^-\pi^0\pi^0$	( 2.2 ±0.4 ) × 10 <sup>-3</sup>	1658	DESIG=52	
$K^+\pi^-K^0\pi^0+$ c.c.	( 1.50±0.22 ) %	1657	DESIG=54	
$\rho^+K^-K^0+$ c.c.	( 4.5 ±1.4 ) × 10 <sup>-3</sup>	1540	DESIG=55	
$K^*(892)^0K^+\pi^- \rightarrow$ $K^+\pi^-K^0\pi^0+$ c.c.	( 3.2 ±0.9 ) × 10 <sup>-3</sup>	—	DESIG=60	
$K^*(892)^0K^0\pi^0 \rightarrow$ $K^+\pi^-K^0\pi^0+$ c.c.	( 4.2 ±0.9 ) × 10 <sup>-3</sup>	—	DESIG=56	
$K^*(892)^-K^+\pi^0 \rightarrow$ $K^+\pi^-K^0\pi^0+$ c.c.	( 4.1 ±0.9 ) × 10 <sup>-3</sup>	—	DESIG=57	
$K^*(892)^+K^0\pi^- \rightarrow$ $K^+\pi^-K^0\pi^0+$ c.c.	( 3.2 ±0.9 ) × 10 <sup>-3</sup>	—	DESIG=58	
$K^+K^-\eta\pi^0$	( 1.4 ±0.5 ) × 10 <sup>-3</sup>	1549	DESIG=59	
$\pi^+\pi^-K^+K^-$	( 9.2 ±1.1 ) × 10 <sup>-3</sup>	1656	DESIG=5	
$K^+\overline{K}^*(892)^0\pi^-+$ c.c.	( 2.3 ±1.2 ) × 10 <sup>-3</sup>	1602	DESIG=10	
$K^*(892)^0\overline{K}^*(892)^0$	( 2.5 ±0.5 ) × 10 <sup>-3</sup>	1538	DESIG=21	
$3(\pi^+\pi^-)$	( 8.6 ±1.8 ) × 10 <sup>-3</sup>	1707	DESIG=4	
$\phi\phi$	( 1.48±0.28 ) × 10 <sup>-3</sup>	1457	DESIG=16	
$\omega\omega$	( 1.9 ±0.6 ) × 10 <sup>-3</sup>	1597	DESIG=25	
$\pi\pi$	( 2.39±0.14 ) × 10 <sup>-3</sup>	1773	DESIG=22	
$\rho^0\pi^+\pi^-$	( 4.0 ±1.7 ) × 10 <sup>-3</sup>	1681	DESIG=9	
$\pi^+\pi^-\eta$	( 5.2 ±1.4 ) × 10 <sup>-4</sup>	1724	DESIG=39	
$\pi^+\pi^-\eta'$	( 5.4 ±2.0 ) × 10 <sup>-4</sup>	1636	DESIG=42	
$\eta\eta$	( 5.4 ±0.8 ) × 10 <sup>-4</sup>	1692	DESIG=14	
$K^+K^-$	( 1.09±0.08 ) × 10 <sup>-3</sup>	1708	DESIG=2	
$K_S^0K_S^0$	( 5.8 ±0.5 ) × 10 <sup>-4</sup>	1707	DESIG=15	
$\overline{K}^0K^+\pi^-+$ c.c.	( 1.32±0.20 ) × 10 <sup>-3</sup>	1685	DESIG=17	
$K^+K^-\pi^0$	( 3.3 ±0.8 ) × 10 <sup>-4</sup>	1686	DESIG=36	
$K^+K^-\eta$	< 3.5 × 10 <sup>-4</sup>	90%	1592	DESIG=40
$\eta\eta'$	< 6 × 10 <sup>-5</sup>	90%	1600	DESIG=34
$\eta'\eta'$	< 1.1 × 10 <sup>-4</sup>	90%	1498	DESIG=35
$\pi^+\pi^-K_S^0K_S^0$	( 2.4 ±0.6 ) × 10 <sup>-3</sup>	1655	DESIG=29	
$K^+K^-K_S^0K_S^0$	< 4 × 10 <sup>-4</sup>	90%	1418	DESIG=30
$K^+K^-K^+K^-$	( 1.78±0.22 ) × 10 <sup>-3</sup>	1421	DESIG=24	
$K^+K^-\phi$	( 1.55±0.32 ) × 10 <sup>-3</sup>	1468	DESIG=32	
$K_S^0K_S^0p\bar{p}$	< 7.9 × 10 <sup>-4</sup>	90%	1007	DESIG=28
$p\bar{p}$	( 7.2 ±0.4 ) × 10 <sup>-5</sup>	1510	DESIG=11	
$p\bar{p}\pi^0$	( 4.7 ±1.0 ) × 10 <sup>-4</sup>	1465	DESIG=37	
$p\bar{p}\eta$	( 2.0 ±0.8 ) × 10 <sup>-4</sup>	1285	DESIG=41	
$\pi^+\pi^-p\bar{p}$	( 1.32±0.34 ) × 10 <sup>-3</sup>	1410	DESIG=8	
$\pi^0\pi^0p\bar{p}$	( 8.5 ±2.6 ) × 10 <sup>-4</sup>	1414	DESIG=53	
$p\bar{\pi}\pi^-$	( 1.1 ±0.4 ) × 10 <sup>-3</sup>	1463	DESIG=31	
$\Lambda\overline{\Lambda}$	( 1.86±0.27 ) × 10 <sup>-4</sup>	1385	DESIG=19	
$\Lambda\overline{\Lambda}\pi^+\pi^-$	< 3.5 × 10 <sup>-3</sup>	90%	1255	DESIG=27
$K^+\overline{p}\Lambda +$ c.c.	( 9.1 ±1.8 ) × 10 <sup>-4</sup>	1236	DESIG=38	
$\Sigma^0\overline{\Sigma}^0$	< 8 × 10 <sup>-5</sup>	90%	1319	DESIG=47
$\Sigma^+\overline{\Sigma}^-$	< 7 × 10 <sup>-5</sup>	90%	1322	DESIG=48
$\Xi^0\overline{\Xi}^0$	< 1.1 × 10 <sup>-4</sup>	90%	1197	DESIG=49
$\Xi^-\overline{\Xi}^+$	( 1.55±0.35 ) × 10 <sup>-4</sup>	1189	DESIG=26	
$J/\psi(1S)\pi^+\pi^-\pi^0$	< 1.5 %	90%	185	DESIG=12

**Radiative decays**

$\gamma J/\psi(1S)$	(19.5 ± 0.8) %	430	NODE=M057;CLUMP=B
$\gamma \rho^0$	< 5 × 10 <sup>-5</sup>	90%	DESIG=6
$\gamma \omega$	< 6 × 10 <sup>-6</sup>	90%	DESIG=44
$\gamma \phi$	< 1.2 × 10 <sup>-5</sup>	90%	DESIG=45
$\gamma \gamma$	(2.56 ± 0.16) × 10 <sup>-4</sup>	1778	DESIG=46
			DESIG=7

 **$\eta_c(2S)$** 

$I^G(J^{PC}) = 0^+(0^-+)$

Quantum numbers are quark model predictions.

Mass  $m = 3637 \pm 4$  MeV ( $S = 1.7$ )  
 Full width  $\Gamma = 14 \pm 7$  MeV

NODE=M059

NODE=M059M;DTYPE=M  
 NODE=M059W;DTYPE=G

<b><math>\eta_c(2S)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
hadrons	not seen	—	
$K\bar{K}\pi$	(1.9 ± 1.2) %	1729	NODE=M059215;DESIG=1
$2\pi^+ 2\pi^-$	not seen	1792	DESIG=4
$3\pi^+ 3\pi^-$	not seen	1749	DESIG=5
$K^+ K^- \pi^+ \pi^-$	not seen	1700	DESIG=8;OUR EVAL
$K^+ K^- \pi^+ \pi^- \pi^0$	not seen	1667	DESIG=6
$K^+ K^- 2\pi^+ 2\pi^-$	not seen	1627	DESIG=9;OUR EVAL
$K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$	not seen	1666	DESIG=10;OUR EVAL
$2K^+ 2K^-$	not seen	1470	DESIG=11;OUR EVAL
$p\bar{p}$	not seen	1558	DESIG=7
$\gamma\gamma$	< 5 × 10 <sup>-4</sup>	90%	DESIG=3
$\pi^+ \pi^- \eta$	not seen	1819	DESIG=2
$\pi^+ \pi^- \eta'$	not seen	1766	DESIG=12;OUR EVAL
$K^+ K^- \eta$	not seen	1680	DESIG=13;OUR EVAL
$\pi^+ \pi^- \eta_c(1S)$	not seen	1637	DESIG=14;OUR EVAL
		541	DESIG=15;OUR EVAL

 **$\psi(2S)$** 

$I^G(J^{PC}) = 0^-(1^- -)$

Mass  $m = 3686.09 \pm 0.04$  MeV ( $S = 1.6$ )  
 Full width  $\Gamma = 304 \pm 9$  keV  
 $\Gamma_{ee} = 2.35 \pm 0.04$  keV

NODE=M071

NODE=M071M;DTYPE=M  
 NODE=M071W;DTYPE=G  
 NODE=M071W1;DTYPE=E

<b><math>\psi(2S)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
hadrons	(97.85±0.13) %		—	NODE=M071220;DESIG=3
virtual $\gamma \rightarrow$ hadrons	( 1.73±0.14 ) %	S=1.5	—	DESIG=4
ggg	(10.6 ± 1.6 ) %		—	DESIG=255
$\gamma gg$	( 1.02±0.29 ) %		—	DESIG=256
light hadrons	(15.4 ± 1.5 ) %		—	DESIG=226
$e^+ e^-$	( 7.72±0.17 ) $\times 10^{-3}$		1843	DESIG=1
$\mu^+ \mu^-$	( 7.7 ± 0.8 ) $\times 10^{-3}$		1840	DESIG=2
$\tau^+ \tau^-$	( 3.0 ± 0.4 ) $\times 10^{-3}$		490	DESIG=68
<b>Decays into <math>J/\psi(1S)</math> and anything</b>				
$J/\psi(1S)$ anything	(59.5 ± 0.8 ) %		—	NODE=M071;CLUMP=A
$J/\psi(1S)$ neutrals	(24.5 ± 0.4 ) %		—	DESIG=11
$J/\psi(1S)\pi^+\pi^-$	(33.6 ± 0.4 ) %		477	DESIG=12
$J/\psi(1S)\pi^0\pi^0$	(17.73±0.34) %		481	DESIG=13
$J/\psi(1S)\eta$	( 3.28±0.07) %		199	DESIG=14
$J/\psi(1S)\pi^0$	( 1.30±0.10) $\times 10^{-3}$	S=1.4	528	DESIG=15
<b>Hadronic decays</b>				
$\pi^0 h_c(1P)$	seen		85	NODE=M071;CLUMP=B
3( $\pi^+\pi^-$ ) $\pi^0$	( 3.5 ± 1.6 ) $\times 10^{-3}$		1746	DESIG=254
2( $\pi^+\pi^-$ ) $\pi^0$	( 2.9 ± 1.0 ) $\times 10^{-3}$	S=4.6	1799	DESIG=37
$\rho a_2(1320)$	( 2.6 ± 0.9 ) $\times 10^{-4}$		1500	DESIG=25
$p\bar{p}$	( 2.76±0.12) $\times 10^{-4}$		1586	DESIG=65
$\Delta^{++}\bar{\Delta}^{--}$	( 1.28±0.35) $\times 10^{-4}$		1371	DESIG=27
$\Lambda\bar{\Lambda}\pi^0$	< 1.2 $\times 10^{-4}$	CL=90%	1412	DESIG=70
$\Lambda\bar{\Lambda}\eta$	< 4.9 $\times 10^{-5}$	CL=90%	1197	DESIG=238
$\Lambda\bar{p}K^+$	( 1.00±0.14) $\times 10^{-4}$		1327	DESIG=239
$\Lambda\bar{p}K^+\pi^+\pi^-$	( 1.8 ± 0.4 ) $\times 10^{-4}$		1167	DESIG=214
$\Lambda\bar{\Lambda}\pi^+\pi^-$	( 2.8 ± 0.6 ) $\times 10^{-4}$		1346	DESIG=215
$\Lambda\bar{\Lambda}$	( 2.8 ± 0.5 ) $\times 10^{-4}$	S=2.6	1467	DESIG=213
$\Sigma^+\bar{\Sigma}^-$	( 2.6 ± 0.8 ) $\times 10^{-4}$		1408	DESIG=28
$\Sigma^0\bar{\Sigma}^0$	( 2.2 ± 0.4 ) $\times 10^{-4}$	S=1.5	1405	DESIG=223
$\Sigma(1385)^+\bar{\Sigma}(1385)^-$	( 1.1 ± 0.4 ) $\times 10^{-4}$		1218	DESIG=71
$\Xi^-\bar{\Xi}^+$	( 1.8 ± 0.6 ) $\times 10^{-4}$	S=2.8	1284	DESIG=72
$\Xi^0\bar{\Xi}^0$	( 2.8 ± 0.9 ) $\times 10^{-4}$		1291	DESIG=29
$\Xi(1530)^0\bar{\Xi}(1530)^0$	< 8.1 $\times 10^{-5}$	CL=90%	1025	DESIG=224
$\Omega^-\bar{\Omega}^+$	< 7.3 $\times 10^{-5}$	CL=90%	774	DESIG=73
$\pi^0 p\bar{p}$	( 1.33±0.17) $\times 10^{-4}$		1543	DESIG=74
$\eta p\bar{p}$	( 6.0 ± 1.2 ) $\times 10^{-5}$		1373	DESIG=35
$\omega p\bar{p}$	( 6.9 ± 2.1 ) $\times 10^{-5}$		1247	DESIG=200
$\phi p\bar{p}$	< 2.4 $\times 10^{-5}$	CL=90%	1109	DESIG=77
$\pi^+\pi^- p\bar{p}$	( 6.0 ± 0.4 ) $\times 10^{-4}$		1491	DESIG=80
$p\bar{n}\pi^-$ or c.c.	( 2.48±0.17) $\times 10^{-4}$		—	DESIG=31
$p\bar{n}\pi^-\pi^0$	( 3.2 ± 0.7 ) $\times 10^{-4}$		1492	DESIG=227
2( $\pi^+\pi^-\pi^0$ )	( 4.8 ± 1.5 ) $\times 10^{-3}$		1776	DESIG=228
$\eta\pi^+\pi^-$	< 1.6 $\times 10^{-4}$	CL=90%	1791	DESIG=221
$\eta\pi^+\pi^-\pi^0$	( 9.5 ± 1.7 ) $\times 10^{-4}$		1778	DESIG=202
2( $\pi^+\pi^-$ ) $\eta$	( 1.2 ± 0.6 ) $\times 10^{-3}$		1758	DESIG=203
$\eta'\pi^+\pi^-\pi^0$	( 4.5 ± 2.1 ) $\times 10^{-4}$		1692	DESIG=251
$\omega\pi^+\pi^-$	( 7.3 ± 1.2 ) $\times 10^{-4}$	S=2.1	1748	DESIG=204
$b_1^\pm\pi^\mp$	( 4.0 ± 0.6 ) $\times 10^{-4}$	S=1.1	1748	DESIG=75
$b_1^0\pi^0$	( 2.4 ± 0.6 ) $\times 10^{-4}$		1635	DESIG=40
$\omega f_2(1270)$	( 2.2 ± 0.4 ) $\times 10^{-4}$		—	DESIG=193
$\pi^+\pi^- K^+K^-$	( 7.5 ± 0.9 ) $\times 10^{-4}$	S=1.9	1515	DESIG=26
$\rho^0 K^+K^-$	( 2.2 ± 0.4 ) $\times 10^{-4}$		1726	DESIG=205
$K^*(892)^0\bar{K}_2^*(1430)^0$	( 1.9 ± 0.5 ) $\times 10^{-4}$		1616	DESIG=66
$K^+K^-\pi^+\pi^-\eta$	( 1.3 ± 0.7 ) $\times 10^{-3}$		1418	DESIG=252
$K^+K^-2(\pi^+\pi^-)\pi^0$	( 1.00±0.31) $\times 10^{-3}$		1574	DESIG=240
$K^+K^-2(\pi^+\pi^-)$	( 1.9 ± 0.9 ) $\times 10^{-3}$		1611	DESIG=222
$K_1(1270)^\pm K^\mp$	( 1.00±0.28) $\times 10^{-3}$		1654	DESIG=41

$K_S^0 K_S^0 \pi^+ \pi^-$	( 2.2 ± 0.4 ) × 10 <sup>-4</sup>	1724	DESIG=225	
$\rho^0 p \bar{p}$	( 5.0 ± 2.2 ) × 10 <sup>-5</sup>	1251	DESIG=210	
$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	( 6.7 ± 2.5 ) × 10 <sup>-4</sup>	1674	DESIG=34	
$2(\pi^+ \pi^-)$	( 2.4 ± 0.6 ) × 10 <sup>-4</sup>	S=2.2	1817	DESIG=24
$\rho^0 \pi^+ \pi^-$	( 2.2 ± 0.6 ) × 10 <sup>-4</sup>	S=1.4	1750	DESIG=33
$K^+ K^- \pi^+ \pi^- \pi^0$	( 1.26 ± 0.09 ) × 10 <sup>-3</sup>		1694	DESIG=206
$\omega f_0(1710) \rightarrow \omega K^+ K^-$	( 5.9 ± 2.2 ) × 10 <sup>-5</sup>		—	DESIG=216
$K^*(892)^0 K^- \pi^+ \pi^0 + \text{c.c.}$	( 8.6 ± 2.2 ) × 10 <sup>-4</sup>		—	DESIG=217
$K^*(892)^+ K^- \pi^+ \pi^- + \text{c.c.}$	( 9.6 ± 2.8 ) × 10 <sup>-4</sup>		—	DESIG=218
$K^*(892)^+ K^- \rho^0 + \text{c.c.}$	( 7.3 ± 2.6 ) × 10 <sup>-4</sup>		—	DESIG=219
$K^*(892)^0 K^- \rho^+ + \text{c.c.}$	( 6.1 ± 1.8 ) × 10 <sup>-4</sup>		—	DESIG=220
$\eta K^+ K^-$	< 1.3 × 10 <sup>-4</sup>	CL=90%	1664	DESIG=207
$\omega K^+ K^-$	( 1.85 ± 0.25 ) × 10 <sup>-4</sup>	S=1.1	1614	DESIG=76
$3(\pi^+ \pi^-)$	( 3.5 ± 2.0 ) × 10 <sup>-4</sup>	S=2.8	1774	DESIG=32
$p \bar{p} \pi^+ \pi^- \pi^0$	( 7.3 ± 0.7 ) × 10 <sup>-4</sup>		1435	DESIG=211
$K^+ K^-$	( 6.3 ± 0.7 ) × 10 <sup>-5</sup>		1776	DESIG=23
$K_S^0 K_L^0$	( 5.4 ± 0.5 ) × 10 <sup>-5</sup>		1775	DESIG=85
$\pi^+ \pi^- \pi^0$	( 1.68 ± 0.26 ) × 10 <sup>-4</sup>	S=1.4	1830	DESIG=36
$\rho(2150) \pi \rightarrow \pi^+ \pi^- \pi^0$	( 1.9 ± 1.2 ) × 10 <sup>-4</sup>		—	DESIG=201
$\rho(770) \pi \rightarrow \pi^+ \pi^- \pi^0$	( 3.2 ± 1.2 ) × 10 <sup>-5</sup>	S=1.8	—	DESIG=22
$\pi^+ \pi^-$	( 8 ± 5 ) × 10 <sup>-5</sup>		1838	DESIG=21
$K_1(1400)^{\pm} K^{\mp}$	< 3.1 × 10 <sup>-4</sup>	CL=90%	1532	DESIG=42
$K^+ K^- \pi^0$	< 2.96 × 10 <sup>-5</sup>	CL=90%	1754	DESIG=38
$K^+ \bar{K}^*(892)^- + \text{c.c.}$	( 1.7 ± 0.8 ) × 10 <sup>-5</sup>		1698	DESIG=39
$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	( 1.09 ± 0.20 ) × 10 <sup>-4</sup>		1697	DESIG=194
$\phi \pi^+ \pi^-$	( 1.17 ± 0.29 ) × 10 <sup>-4</sup>	S=1.7	1690	DESIG=78
$\phi f_0(980) \rightarrow \pi^+ \pi^-$	( 6.8 ± 2.4 ) × 10 <sup>-5</sup>	S=1.1	—	DESIG=81
$2(K^+ K^-)$	( 6.0 ± 1.4 ) × 10 <sup>-5</sup>		1499	DESIG=208
$\phi K^+ K^-$	( 7.0 ± 1.6 ) × 10 <sup>-5</sup>		1546	DESIG=79
$2(K^+ K^-) \pi^0$	( 1.10 ± 0.28 ) × 10 <sup>-4</sup>		1440	DESIG=209
$\phi \eta$	( 2.8 ± 1.0 ) × 10 <sup>-5</sup>		1654	DESIG=89
$\phi \eta'$	( 3.1 ± 1.6 ) × 10 <sup>-5</sup>		1555	DESIG=90
$\omega \eta'$	( 3.2 ± 2.5 ) × 10 <sup>-5</sup>		1623	DESIG=91
$\omega \pi^0$	( 2.1 ± 0.6 ) × 10 <sup>-5</sup>		1757	DESIG=92
$\rho \eta'$	( 1.9 ± 1.7 ) × 10 <sup>-5</sup>		1625	DESIG=93
$\rho \eta$	( 2.2 ± 0.6 ) × 10 <sup>-5</sup>	S=1.1	1717	DESIG=94
$\omega \eta$	< 1.1 × 10 <sup>-5</sup>	CL=90%	1715	DESIG=95
$\phi \pi^0$	< 4 × 10 <sup>-6</sup>	CL=90%	1699	DESIG=96
$\eta_c \pi^+ \pi^- \pi^0$	< 1.0 × 10 <sup>-3</sup>	CL=90%	—	DESIG=229
$p \bar{p} K^+ K^-$	( 2.7 ± 0.7 ) × 10 <sup>-5</sup>		1118	DESIG=212
$\bar{\Lambda} n K_S^0 + \text{c.c.}$	( 8.1 ± 1.8 ) × 10 <sup>-5</sup>		1324	DESIG=237
$\phi f'_2(1525)$	( 4.4 ± 1.6 ) × 10 <sup>-5</sup>		1321	DESIG=67
$\Theta(1540) \bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.}$	< 8.8 × 10 <sup>-6</sup>	CL=90%	—	DESIG=195
$\Theta(1540) K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n}$	< 1.0 × 10 <sup>-5</sup>	CL=90%	—	DESIG=196
$\Theta(1540) K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n$	< 7.0 × 10 <sup>-6</sup>	CL=90%	—	DESIG=197
$\bar{\Theta}(1540) K^+ n \rightarrow K_S^0 \bar{p} K^+ n$	< 2.6 × 10 <sup>-5</sup>	CL=90%	—	DESIG=198
$\bar{\Theta}(1540) K_S^0 p \rightarrow K_S^0 p K^- \bar{n}$	< 6.0 × 10 <sup>-6</sup>	CL=90%	—	DESIG=199
$K_S^0 K_S^0$	< 4.6 × 10 <sup>-6</sup>		1775	DESIG=86

**Radiative decays**

				NODE=M071;CLUMP=C
$\gamma \chi_{c0}(1P)$	( 9.62 $\pm$ 0.31 ) %		261	DESIG=56
$\gamma \chi_{c1}(1P)$	( 9.2 $\pm$ 0.4 ) %		171	DESIG=58
$\gamma \chi_{c2}(1P)$	( 8.74 $\pm$ 0.35 ) %		128	DESIG=59
$\pi^0 h_c \rightarrow \gamma \eta_c(1S) \pi^0$	( 4.2 $\pm$ 0.5 ) $\times 10^{-4}$		—	DESIG=253
$\gamma \eta_c(1S)$	( 3.4 $\pm$ 0.5 ) $\times 10^{-3}$	S=1.3	638	DESIG=61
$\gamma \eta_c(2S)$	< 8 $\times 10^{-4}$	CL=90%	48	DESIG=63
$\gamma \pi^0$	< 5 $\times 10^{-6}$	CL=90%	1841	DESIG=52
$\gamma \eta'(958)$	( 1.21 $\pm$ 0.08 ) $\times 10^{-4}$		1719	DESIG=54
$\gamma f_2(1270)$	( 2.1 $\pm$ 0.4 ) $\times 10^{-4}$		1622	DESIG=82
$\gamma f_0(1710) \rightarrow \gamma \pi \pi$	( 3.0 $\pm$ 1.3 ) $\times 10^{-5}$		—	DESIG=83
$\gamma f_0(1710) \rightarrow \gamma K \bar{K}$	( 6.0 $\pm$ 1.6 ) $\times 10^{-5}$		—	DESIG=84
$\gamma \gamma$	< 1.4 $\times 10^{-4}$	CL=90%	1843	DESIG=51
$\gamma \eta$	< 2 $\times 10^{-6}$	CL=90%	1802	DESIG=53
$\gamma \eta \pi^+ \pi^-$	( 8.7 $\pm$ 2.1 ) $\times 10^{-4}$		1791	DESIG=230
$\gamma \eta(1405) \rightarrow \gamma K \bar{K} \pi$	< 9 $\times 10^{-5}$	CL=90%	1569	DESIG=62
$\gamma \eta(1405) \rightarrow \eta \pi^+ \pi^-$	( 3.6 $\pm$ 2.5 ) $\times 10^{-5}$		—	DESIG=232
$\gamma \eta(1475) \rightarrow K \bar{K} \pi$	< 1.4 $\times 10^{-4}$	CL=90%	—	DESIG=234
$\gamma \eta(1475) \rightarrow \eta \pi^+ \pi^-$	< 8.8 $\times 10^{-5}$	CL=90%	—	DESIG=235
$\gamma 2(\pi^+ \pi^-)$	( 4.0 $\pm$ 0.6 ) $\times 10^{-4}$		1817	DESIG=241
$\gamma K^{*0} K^+ \pi^- + \text{c.c.}$	( 3.7 $\pm$ 0.9 ) $\times 10^{-4}$		1674	DESIG=242
$\gamma K^{*0} \bar{K}^{*0}$	( 2.4 $\pm$ 0.7 ) $\times 10^{-4}$		1613	DESIG=243
$\gamma K_S^0 K^+ \pi^- + \text{c.c.}$	( 2.6 $\pm$ 0.5 ) $\times 10^{-4}$		1753	DESIG=244
$\gamma K^+ K^- \pi^+ \pi^-$	( 1.9 $\pm$ 0.5 ) $\times 10^{-4}$		1726	DESIG=245
$\gamma p \bar{p}$	( 2.9 $\pm$ 0.6 ) $\times 10^{-5}$		1586	DESIG=246
$\gamma \pi^+ \pi^- p \bar{p}$	( 2.8 $\pm$ 1.4 ) $\times 10^{-5}$		1491	DESIG=247
$\gamma 2(\pi^+ \pi^-) K^+ K^-$	< 2.2 $\times 10^{-4}$	CL=90%	1654	DESIG=248
$\gamma 3(\pi^+ \pi^-)$	< 1.7 $\times 10^{-4}$	CL=90%	1774	DESIG=249
$\gamma K^+ K^- K^+ K^-$	< 4 $\times 10^{-5}$	CL=90%	1499	DESIG=250

 **$\psi(3770)$**  $I^G(J^{PC}) = 0^-(1^{--})$ Mass  $m = 3772.92 \pm 0.35$  MeV (S = 1.1)Full width  $\Gamma = 27.3 \pm 1.0$  MeV $\Gamma_{ee} = 0.265 \pm 0.018$  keV (S = 1.3)

NODE=M053

NODE=M053M;DTYPE=M

NODE=M053W;DTYPE=G

NODE=M053W1;DTYPE=E

In addition to the dominant decay mode to  $D\bar{D}$ ,  $\psi(3770)$  was found to decay into the final states containing the  $J/\psi$  (BAI 05, ADAM 06). ADAMS 06 and HUANG 06A searched for various decay modes with light hadrons and found a statistically significant signal for the decay to  $\phi\eta$  only (ADAMS 06).

NODE=M053220;NODE=M053

$\psi(3770)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)	
$D\bar{D}$	(85.3 $\pm$ 3.2) %		285	DESIG=2
$D^0\bar{D}^0$	(48.7 $\pm$ 3.2) %		285	DESIG=5
$D^+D^-$	(36.1 $\pm$ 2.8) %		251	DESIG=6
$J/\psi\pi^+\pi^-$	( 1.93 $\pm$ 0.28) $\times 10^{-3}$		560	DESIG=4
$J/\psi\pi^0\pi^0$	( 8.0 $\pm$ 3.0) $\times 10^{-4}$		564	DESIG=46
$J/\psi\eta$	( 9 $\pm$ 4) $\times 10^{-4}$		359	DESIG=47
$J/\psi\pi^0$	< 2.8 $\times 10^{-4}$	CL=90%	603	DESIG=48
$\gamma\chi_{c0}$	( 7.3 $\pm$ 0.9) $\times 10^{-3}$		341	DESIG=49
$\gamma\chi_{c1}$	( 2.9 $\pm$ 0.6) $\times 10^{-3}$		253	DESIG=50
$\gamma\chi_{c2}$	< 9 $\times 10^{-4}$	CL=90%	210	DESIG=51
$e^+e^-$	( 9.7 $\pm$ 0.7) $\times 10^{-6}$	S=1.2	1886	DESIG=1
$K_S^0K_L^0$	< 1.2 $\times 10^{-5}$	CL=90%	1820	DESIG=3
$2(\pi^+\pi^-)$	< 1.12 $\times 10^{-3}$	CL=90%	1861	DESIG=21
$2(\pi^+\pi^-)\pi^0$	< 1.06 $\times 10^{-3}$	CL=90%	1843	DESIG=22
$2(\pi^+\pi^-\pi^0)$	< 5.85 %	CL=90%	1821	DESIG=208
$\omega\pi^+\pi^-$	< 6.0 $\times 10^{-4}$	CL=90%	1794	DESIG=24
$3(\pi^+\pi^-)$	< 9.1 $\times 10^{-3}$		1819	DESIG=52
$3(\pi^+\pi^-)\pi^0$	< 1.37 %		1792	DESIG=55
$3(\pi^+\pi^-)2\pi^0$	< 11.74 %	CL=90%	1759	DESIG=210
$\eta\pi^+\pi^-$	< 1.24 $\times 10^{-3}$	CL=90%	1836	DESIG=23
$\pi^+\pi^-2\pi^0$	< 8.9 $\times 10^{-3}$	CL=90%	1862	DESIG=206
$\rho^0\pi^+\pi^-$	< 6.9 $\times 10^{-3}$	CL=90%	1796	DESIG=64
$\eta 3\pi$	< 1.34 $\times 10^{-3}$	CL=90%	1824	DESIG=25
$\eta 2(\pi^+\pi^-)$	< 2.43 %		1804	DESIG=53
$\eta' 3\pi$	< 2.44 $\times 10^{-3}$	CL=90%	1740	DESIG=26
$K^+K^-\pi^+\pi^-$	< 9.0 $\times 10^{-4}$	CL=90%	1772	DESIG=27
$\phi\pi^+\pi^-$	< 4.1 $\times 10^{-4}$	CL=90%	1737	DESIG=28
$K^+K^-2\pi^0$	< 4.2 $\times 10^{-3}$	CL=90%	1774	DESIG=207
$\phi\pi^0$	not seen		1746	DESIG=12;OUR EVAL; NOT CHECKED ← DESIG=8
$\phi\eta$	( 3.1 $\pm$ 0.7) $\times 10^{-4}$		1703	
$4(\pi^+\pi^-)$	< 1.67 %	CL=90%	1757	DESIG=62
$4(\pi^+\pi^-)\pi^0$	< 3.06 %	CL=90%	1720	DESIG=63
$\phi f_0(980)$	< 4.5 $\times 10^{-4}$	CL=90%	1600	DESIG=29
$K^+K^-\pi^+\pi^-\pi^0$	< 2.36 $\times 10^{-3}$	CL=90%	1741	DESIG=30
$K^+K^-\rho^0\pi^0$	< 8 $\times 10^{-4}$	CL=90%	1624	DESIG=67
$K^+K^-\rho^+\pi^-$	< 1.46 %	CL=90%	1622	DESIG=68
$\omega K^+K^-$	< 3.4 $\times 10^{-4}$	CL=90%	1664	DESIG=32
$\phi\pi^+\pi^-\pi^0$	< 3.8 $\times 10^{-3}$	CL=90%	1722	DESIG=69
$K^{*0}K^-\pi^+\pi^0 + \text{c.c.}$	< 1.62 %	CL=90%	1693	DESIG=70
$K^{*+}K^-\pi^+\pi^- + \text{c.c.}$	< 3.23 %	CL=90%	1692	DESIG=71
$K^+K^-\pi^+\pi^-2\pi^0$	< 2.67 %	CL=90%	1705	DESIG=209
$K^+K^-2(\pi^+\pi^-)$	< 1.03 %	CL=90%	1702	DESIG=57
$K^+K^-2(\pi^+\pi^-)\pi^0$	< 3.60 %	CL=90%	1660	DESIG=58
$\eta K^+K^-$	< 4.1 $\times 10^{-4}$	CL=90%	1711	DESIG=31
$\rho^0 K^+K^-$	< 5.0 $\times 10^{-3}$	CL=90%	1665	DESIG=65
$2(K^+K^-)$	< 6.0 $\times 10^{-4}$	CL=90%	1551	DESIG=33
$\phi K^+K^-$	< 7.5 $\times 10^{-4}$	CL=90%	1597	DESIG=34
$2(K^+K^-)\pi^0$	< 2.9 $\times 10^{-4}$	CL=90%	1493	DESIG=35
$2(K^+K^-)\pi^+\pi^-$	< 3.2 $\times 10^{-3}$	CL=90%	1425	DESIG=59
$K_S^0K^-\pi^+$	< 3.2 $\times 10^{-3}$	CL=90%	1799	DESIG=200
$K_S^0K^-\pi^+\pi^0$	< 1.33 %	CL=90%	1773	DESIG=201
$K_S^0K^-\rho^+$	< 6.6 $\times 10^{-3}$	CL=90%	1664	DESIG=214

$K_S^0 K^- 2\pi^+ \pi^-$	< 8.7	$\times 10^{-3}$	CL=90%	1739	DESIG=202
$K_S^0 K^- \pi^+ \rho^0$	< 1.6	%	CL=90%	1621	DESIG=215
$K_S^0 K^- \pi^+ \eta$	< 1.3	%	CL=90%	1669	DESIG=216
$K_S^0 K^- 2\pi^+ \pi^- \pi^0$	< 4.18	%	CL=90%	1703	DESIG=203
$K_S^0 K^- 2\pi^+ \pi^- \eta$	< 4.8	%	CL=90%	1570	DESIG=217
$K_S^0 K^- \pi^+ 2(\pi^+ \pi^-)$	< 1.22	%	CL=90%	1658	DESIG=204
$K_S^0 K^- \pi^+ 2\pi^0$	< 2.65	%	CL=90%	1741	DESIG=205
$K_S^0 K^- K^+ K^- \pi^+$	< 4.9	$\times 10^{-3}$	CL=90%	1490	DESIG=218
$K_S^0 K^- K^+ K^- \pi^+ \pi^0$	< 3.0	%	CL=90%	1427	DESIG=219
$K_S^0 K^- K^+ K^- \pi^+ \eta$	< 2.2	%	CL=90%	1214	DESIG=220
$K^{*0} K^- \pi^+ + \text{c.c.}$	< 9.7	$\times 10^{-3}$	CL=90%	1721	DESIG=60
$p\bar{p}\pi^0$	< 1.2	$\times 10^{-3}$		1595	DESIG=54
$p\bar{p}\pi^+ \pi^-$	< 5.8	$\times 10^{-4}$	CL=90%	1544	DESIG=36
$\Lambda\bar{\Lambda}$	< 1.2	$\times 10^{-4}$	CL=90%	1521	DESIG=42
$p\bar{p}\pi^+ \pi^- \pi^0$	< 1.85	$\times 10^{-3}$	CL=90%	1490	DESIG=37
$\omega p\bar{p}$	< 2.9	$\times 10^{-4}$	CL=90%	1309	DESIG=39
$\Lambda\bar{\Lambda}\pi^0$	< 1.2	$\times 10^{-3}$	CL=90%	1468	DESIG=72
$p\bar{p}2(\pi^+ \pi^-)$	< 2.6	$\times 10^{-3}$	CL=90%	1425	DESIG=61
$\eta p\bar{p}$	< 5.4	$\times 10^{-4}$	CL=90%	1430	DESIG=38
$\rho^0 p\bar{p}$	< 1.7	$\times 10^{-3}$	CL=90%	1313	DESIG=66
$p\bar{p}K^+ K^-$	< 3.2	$\times 10^{-4}$	CL=90%	1185	DESIG=40
$\phi p\bar{p}$	< 1.3	$\times 10^{-4}$	CL=90%	1178	DESIG=41
$\Lambda\bar{\Lambda}\pi^+ \pi^-$	< 2.5	$\times 10^{-4}$	CL=90%	1404	DESIG=43
$\Lambda\bar{p}K^+$	< 2.8	$\times 10^{-4}$	CL=90%	1387	DESIG=44
$\Lambda\bar{p}K^+ \pi^+ \pi^-$	< 6.3	$\times 10^{-4}$	CL=90%	1234	DESIG=45
$\pi^+ \pi^- \pi^0$	not seen			1874	DESIG=9;OUR EVAL; $\rightarrow$ NOT CHECKED $\leftarrow$
$\rho\pi$	not seen			1804	DESIG=10;OUR EVAL;
$\omega\pi^0$	not seen			1803	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=11;OUR EVAL;
$\rho\eta$	not seen			1763	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=13;OUR EVAL;
$\omega\eta$	not seen			1762	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=14;OUR EVAL;
$\rho\eta'$	not seen			1674	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=15;OUR EVAL;
$\omega\eta'$	not seen			1672	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=16;OUR EVAL;
$\phi\eta'$	not seen			1606	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=17;OUR EVAL;
$K^{*0}\bar{K}^0$	not seen			1744	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=18;OUR EVAL;
$K^{*+} K^-$	not seen			1745	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=19;OUR EVAL;
$b_1\pi$	not seen			1683	$\rightarrow$ NOT CHECKED $\leftarrow$ DESIG=20;OUR EVAL; $\rightarrow$ NOT CHECKED $\leftarrow$
<b>Radiative decays</b>					
$\gamma\pi^0$	< 2	$\times 10^{-4}$	CL=90%	1884	NODE=M053;CLUMP=R DESIG=211
$\gamma\eta$	< 1.5	$\times 10^{-4}$	CL=90%	1847	DESIG=212
$\gamma\eta'$	< 1.8	$\times 10^{-4}$	CL=90%	1765	DESIG=213

**X(3872)** $I^G(J^{PC}) = 0^? (?^? +)$ 

NODE=M176

Quantum numbers not established.

Mass  $m = 3871.56 \pm 0.22$  MeV

NODE=M176M;DTYPE=M

 $m_{X(3872)} - m_{J/\psi} = 775 \pm 4$  MeV

NODE=M176DM;DTYPE=D

 $m_{X(3872)} - m_{\psi(2S)}$ 

NODE=M176DM2;DTYPE=D

Full width  $\Gamma < 2.3$  MeV, CL = 90%

NODE=M176W;DTYPE=G

<b>X(3872) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$\pi^+ \pi^- J/\psi(1S)$	>2.6 %	90%	650
$D^0 \bar{D}^0 \pi^0$	> $3.2 \times 10^{-3}$		116
$\bar{D}^{*0} D^0$	> $5 \times 10^{-3}$		†
$\gamma J/\psi$	> $9 \times 10^{-3}$		697
$\gamma \psi(2S)$	>3.0 %		181

**X(3945)**

$I^G(J^P C) = 0^+(?^?+)$

Observed in  $\omega J/\psi$ , thus  $C = +$ 

Mass  $m = 3915.5 \pm 2.7$  MeV  
 Full width  $\Gamma = 28_{-10}^{+12}$  MeV (S = 1.5)

<b>X(3945) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\omega J/\psi$	seen	214
$\gamma\gamma$	seen	1958

 **$\psi(4040)$  [t]**

$I^G(J^P C) = 0^-(1^{--})$

Mass  $m = 4039 \pm 1$  MeV  
 Full width  $\Gamma = 80 \pm 10$  MeV  
 $\Gamma_{ee} = 0.86 \pm 0.07$  keV

<b><math>\psi(4040)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)
$e^+ e^-$	$(1.07 \pm 0.16) \times 10^{-5}$		2019
$D \bar{D}$	seen		775
$D^0 \bar{D}^0$	seen		775
$D^+ D^-$	seen		764
$D^* \bar{D} + \text{c.c.}$	seen		569
$D^*(2007)^0 \bar{D}^0 + \text{c.c.}$	seen		575
$D^*(2010)^+ D^- + \text{c.c.}$	seen		561
$D^* \bar{D}^*$	not seen		193
$D^*(2007)^0 \bar{D}^*(2007)^0$	not seen		225
$D^*(2010)^+ D^*(2010)^-$	not seen		193
$J/\psi \pi^+ \pi^-$	$< 4 \times 10^{-3}$	90%	794
$J/\psi \pi^0 \pi^0$	$< 2 \times 10^{-3}$	90%	797
$J/\psi \eta$	$< 7 \times 10^{-3}$	90%	675
$J/\psi \pi^0$	$< 2 \times 10^{-3}$	90%	823
$J/\psi \pi^+ \pi^- \pi^0$	$< 2 \times 10^{-3}$	90%	746
$\chi_{c1} \gamma$	$< 1.1 \%$	90%	494
$\chi_{c2} \gamma$	$< 1.7 \%$	90%	454
$\chi_{c1} \pi^+ \pi^- \pi^0$	$< 1.1 \%$	90%	306
$\chi_{c2} \pi^+ \pi^- \pi^0$	$< 3.2 \%$	90%	233
$\phi \pi^+ \pi^-$	$< 3 \times 10^{-3}$	90%	1880

 **$\psi(4160)$  [t]**

$I^G(J^P C) = 0^-(1^{--})$

Mass  $m = 4153 \pm 3$  MeV  
 Full width  $\Gamma = 103 \pm 8$  MeV  
 $\Gamma_{ee} = 0.83 \pm 0.07$  keV

NODE=M176215;DESIG=2  
 DESIG=8  
 DESIG=12  
 DESIG=9  
 DESIG=11

NODE=M159

NODE=M159M;DTYPE=M  
 NODE=M159W;DTYPE=G

NODE=M159215;DESIG=1;OUR EST;  
 → NOT CHECKED ←  
 DESIG=2

NODE=M072

NODE=M072M;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M072W;DTYPE=G;OUR EST;  
 → NOT CHECKED ←  
 NODE=M072W5;DTYPE=E;OUR EST;  
 → NOT CHECKED ←

NODE=M072215;DESIG=5  
 DESIG=17;OUR EST;→ NOT CHECKED ←  
 DESIG=1;OUR EST;→ NOT CHECKED ←  
 DESIG=18;OUR EST;→ NOT CHECKED ←  
 DESIG=19;OUR EST;→ NOT CHECKED ←  
 DESIG=2;OUR EST;→ NOT CHECKED ←  
 DESIG=20;OUR EST;→ NOT CHECKED ←  
 DESIG=21;OUR EST;→ NOT CHECKED ←  
 DESIG=3;OUR EST;→ NOT CHECKED ←  
 DESIG=22;OUR EST;→ NOT CHECKED ←  
 DESIG=7  
 DESIG=8  
 DESIG=9  
 DESIG=10  
 DESIG=11  
 DESIG=12  
 DESIG=13  
 DESIG=14  
 DESIG=15  
 DESIG=16

NODE=M025

NODE=M025M;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M025W;DTYPE=G;OUR EST;  
 → NOT CHECKED ←  
 NODE=M025W1;DTYPE=E;OUR EST;  
 → NOT CHECKED ←

<b><math>\psi(4160)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)		
$e^+ e^-$	$(8.1 \pm 0.9) \times 10^{-6}$		2076	NODE=M025215;DESIG=1	
$D\bar{D}$	not seen		913	DESIG=15;OUR EVAL	
$D^0\bar{D}^0$	not seen		913	DESIG=16;OUR EVAL	
$D^+D^-$	not seen		904	DESIG=17;OUR EVAL	
$D^*\bar{D} + \text{c.c.}$	not seen		746	DESIG=18;OUR EVAL	
$D^*(2007)^0\bar{D}^0 + \text{c.c.}$	not seen		751	DESIG=19;OUR EVAL	
$D^*(2010)^+D^- + \text{c.c.}$	not seen		740	DESIG=20;OUR EVAL	
$D^*\bar{D}^*$	seen		520	DESIG=21;OUR EVAL	
$D^*(2007)^0\bar{D}^*(2007)^0$	seen		533	DESIG=22;OUR EVAL	
$D^*(2010)^+D^*(2010)^-$	seen		520	DESIG=23;OUR EVAL	
$J/\psi\pi^+\pi^-$	$< 3$	$\times 10^{-3}$	90%	888	DESIG=2
$J/\psi\pi^0\pi^0$	$< 3$	$\times 10^{-3}$	90%	891	DESIG=3
$J/\psi K^+K^-$	$< 2$	$\times 10^{-3}$	90%	324	DESIG=4
$J/\psi\eta$	$< 8$	$\times 10^{-3}$	90%	786	DESIG=5
$J/\psi\pi^0$	$< 1$	$\times 10^{-3}$	90%	914	DESIG=6
$J/\psi\eta'$	$< 5$	$\times 10^{-3}$	90%	385	DESIG=7
$J/\psi\pi^+\pi^-\pi^0$	$< 1$	$\times 10^{-3}$	90%	847	DESIG=8
$\psi(2S)\pi^+\pi^-$	$< 4$	$\times 10^{-3}$	90%	353	DESIG=9
$\chi_{c1}\gamma$	$< 7$	$\times 10^{-3}$	90%	593	DESIG=10
$\chi_{c2}\gamma$	$< 1.3$	%	90%	554	DESIG=11
$\chi_{c1}\pi^+\pi^-\pi^0$	$< 2$	$\times 10^{-3}$	90%	452	DESIG=12
$\chi_{c2}\pi^+\pi^-\pi^0$	$< 8$	$\times 10^{-3}$	90%	398	DESIG=13
$\phi\pi^+\pi^-$	$< 2$	$\times 10^{-3}$	90%	1941	DESIG=14

**X(4260)**

$I^G(J^{PC}) = ?^?(1^{--})$

Mass  $m = 4263^{+8}_{-9}$  MeV (S = 1.1)Full width  $\Gamma = 95 \pm 14$  MeV

NODE=M074

NODE=M074M;DTYPE=M

NODE=M074W;DTYPE=G

<b>X(4260) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$J/\psi\pi^+\pi^-$	seen	976
$J/\psi\pi^0\pi^0$	[u] seen	978
$J/\psi K^+K^-$	[u] seen	530
$J/\psi\eta$	[u] not seen	886
$J/\psi\pi^0$	[u] not seen	999
$J/\psi\eta'$	[u] not seen	569
$J/\psi\pi^+\pi^-\pi^0$	[u] not seen	939
$J/\psi\eta\eta$	[u] not seen	339
$\psi(2S)\pi^+\pi^-$	[u] not seen	470
$\psi(2S)\eta$	[u] not seen	167
$\chi_{c0}\omega$	[u] not seen	292
$\chi_{c1}\gamma$	[u] not seen	686
$\chi_{c2}\gamma$	[u] not seen	648
$\chi_{c1}\pi^+\pi^-\pi^0$	[u] not seen	571
$\chi_{c2}\pi^+\pi^-\pi^0$	[u] not seen	524
$\phi\pi^+\pi^-$	[u] not seen	1999
$D\bar{D}$	not seen	1032

NODE=M074215;DESIG=2;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=4;OUR EVAL;→ NOT CHECKED ←  
 DESIG=5;OUR EVAL;→ NOT CHECKED ←  
 DESIG=6;OUR EVAL;→ NOT CHECKED ←  
 DESIG=7;OUR EVAL;→ NOT CHECKED ←  
 DESIG=8;OUR EVAL;→ NOT CHECKED ←  
 DESIG=9;OUR EVAL;→ NOT CHECKED ←  
 DESIG=10;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=11;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=12;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=13;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=14;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=15;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=16;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=17;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=18;OUR EVAL;  
 → NOT CHECKED ←  
 DESIG=19;OUR EVAL;  
 → NOT CHECKED ←

 **$\psi(4415)$  [t]**

$I^G(J^{PC}) = 0^-(1^{--})$

Mass  $m = 4421 \pm 4$  MeVFull width  $\Gamma = 62 \pm 20$  MeV $\Gamma_{ee} = 0.58 \pm 0.07$  keV

NODE=M073

NODE=M073M;DTYPE=M;OUR EST;  
 → NOT CHECKED ←  
 NODE=M073W;DTYPE=G;OUR EST;  
 → NOT CHECKED ←  
 NODE=M073W1;DTYPE=E;OUR EST;  
 → NOT CHECKED ←

$\psi(4415)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
hadrons	dominant	—	—	NODE=M073215;DESIG=2
$D\bar{D}$	not seen	1187	DESIG=7;OUR EVAL	
$D^0\bar{D}^0$	not seen	1187	DESIG=8;OUR EVAL	
$D^+D^-$	not seen	1179	DESIG=9;OUR EVAL	
$D^*\bar{D} + \text{c.c.}$	not seen	1063	DESIG=10;OUR EVAL	
$D^*(2007)^0\bar{D}^0 + \text{c.c.}$	not seen	1067	DESIG=11;OUR EVAL	
$D^*(2010)^+D^- + \text{c.c.}$	not seen	1059	DESIG=12;OUR EVAL	
$D^*\bar{D}^*$	not seen	919	DESIG=13;OUR EVAL	
$D^*(2007)^0\bar{D}^*(2007)^0 + \text{c.c.}$	not seen	926	DESIG=14;OUR EVAL	
$D^*(2010)^+D^*(2010)^- + \text{c.c.}$	not seen	919	DESIG=15;OUR EVAL	
$(D^0D^-\pi^+)_{\text{non-res}}$	< 2.3 %	90%	—	DESIG=4
$D\bar{D}_2^*(2460) \rightarrow D^0D^-\pi^+$	(10 ± 4) %	—	—	DESIG=5
$D^0D^{*-}\pi^+$	< 11 %	90%	926	DESIG=6
$e^+e^-$	( 9.4 ± 3.2) × 10 <sup>-6</sup>	—	2210	DESIG=1

## b̄b MESONS

### T(1S)

$$I^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 9460.30 \pm 0.26$  MeV (S = 3.3)

Full width  $\Gamma = 54.02 \pm 1.25$  keV

$\Gamma_{ee} = 1.340 \pm 0.018$  keV

T(1S) DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$\tau^+\tau^-$	( 2.60 ± 0.10 ) %	4384	NODE=M049215;DESIG=3	
$e^+e^-$	( 2.38 ± 0.11 ) %	4730	DESIG=2	
$\mu^+\mu^-$	( 2.48 ± 0.05 ) %	4729	DESIG=1	
<b>Hadronic decays</b>				
$ggg$	( 81.7 ± 0.7 ) %	—	NODE=M049;CLUMP=A	
$\gamma gg$	( 2.2 ± 0.6 ) %	—	DESIG=117	
$\eta'(958)$ anything	( 2.94 ± 0.24 ) %	—	DESIG=118	
$J/\psi(1S)$ anything	( 6.5 ± 0.7 ) × 10 <sup>-4</sup>	4223	DESIG=73	
$\chi_{c0}$ anything	< 5 × 10 <sup>-3</sup>	90%	DESIG=12	
$\chi_{c1}$ anything	( 2.3 ± 0.7 ) × 10 <sup>-4</sup>	—	DESIG=5	
$\chi_{c2}$ anything	( 3.4 ± 1.0 ) × 10 <sup>-4</sup>	—	DESIG=6	
$\psi(2S)$ anything	( 2.7 ± 0.9 ) × 10 <sup>-4</sup>	—	DESIG=7	
$\rho\pi$	< 2 × 10 <sup>-4</sup>	90%	DESIG=8	
$\pi^+\pi^-$	< 5 × 10 <sup>-4</sup>	90%	4697	
$K^+K^-$	< 5 × 10 <sup>-4</sup>	90%	4728	
$p\bar{p}$	< 5 × 10 <sup>-4</sup>	90%	4704	
$\pi^0\pi^+\pi^-$	< 1.84 × 10 <sup>-5</sup>	90%	4636	
$D^*(2010)^\pm$ anything	( 2.52 ± 0.20 ) %	—	DESIG=25	
$d$ anything	( 2.86 ± 0.28 ) × 10 <sup>-5</sup>	—	DESIG=72	
<b>Radiative decays</b>				
$\gamma\pi^+\pi^-$	( 6.3 ± 1.8 ) × 10 <sup>-5</sup>	4728	NODE=M049;CLUMP=B	
$\gamma\pi^0\pi^0$	( 1.7 ± 0.7 ) × 10 <sup>-5</sup>	4728	DESIG=70	
$\gamma\pi^0\eta$	< 2.4 × 10 <sup>-6</sup>	90%	DESIG=71	
$\gamma K^+K^-$	[v] ( 1.14 ± 0.13 ) × 10 <sup>-5</sup>	4713	DESIG=111	
$\gamma p\bar{p}$	[w] < 6 × 10 <sup>-6</sup>	90%	4704	
$\gamma 2h^+2h^-$	( 7.0 ± 1.5 ) × 10 <sup>-4</sup>	4636	DESIG=102	
$\gamma 3h^+3h^-$	( 5.4 ± 2.0 ) × 10 <sup>-4</sup>	4720	DESIG=103	
$\gamma 4h^+4h^-$	( 7.4 ± 3.5 ) × 10 <sup>-4</sup>	4703	DESIG=20	
$\gamma\pi^+\pi^-K^+K^-$	( 2.9 ± 0.9 ) × 10 <sup>-4</sup>	4679	DESIG=21	
$\gamma 2\pi^+2\pi^-$	( 2.5 ± 0.9 ) × 10 <sup>-4</sup>	4686	DESIG=22	
$\gamma 3\pi^+3\pi^-$	( 2.5 ± 1.2 ) × 10 <sup>-4</sup>	4720	DESIG=14	

$\gamma 2\pi^+ 2\pi^- K^+ K^-$	( 2.4 $\pm$ 1.2 ) $\times 10^{-4}$	4658	DESIG=18	
$\gamma \pi^+ \pi^- p\bar{p}$	( 1.5 $\pm$ 0.6 ) $\times 10^{-4}$	4604	DESIG=15	
$\gamma 2\pi^+ 2\pi^- p\bar{p}$	( 4 $\pm$ 6 ) $\times 10^{-5}$	4563	DESIG=19	
$\gamma 2K^+ 2K^-$	( 2.0 $\pm$ 2.0 ) $\times 10^{-5}$	4601	DESIG=16	
$\gamma \eta'(958)$	< 1.9 $\times 10^{-6}$	90%	4682	DESIG=55
$\gamma \eta$	< 1.0 $\times 10^{-6}$	90%	4714	DESIG=54
$\gamma f_0(980)$	< 3 $\times 10^{-5}$	90%	4679	DESIG=105
$\gamma f'_2(1525)$	( 3.7 $^{+1.2}_{-1.1}$ ) $\times 10^{-5}$	4607	DESIG=52	
$\gamma f_2(1270)$	( 1.01 $\pm$ 0.09 ) $\times 10^{-4}$	4644	DESIG=51	
$\gamma \eta(1405)$	< 8.2 $\times 10^{-5}$	90%	4625	DESIG=65
$\gamma f_0(1500)$	< 1.5 $\times 10^{-5}$	90%	4610	DESIG=108
$\gamma f_0(1710)$	< 2.6 $\times 10^{-4}$	90%	4574	DESIG=53
$\gamma f_0(1710) \rightarrow \gamma K^+ K^-$	< 7 $\times 10^{-6}$	90%	—	DESIG=112
$\gamma f_0(1710) \rightarrow \gamma \pi^0 \pi^0$	< 1.4 $\times 10^{-6}$	90%	—	DESIG=109
$\gamma f_0(1710) \rightarrow \gamma \eta \eta$	< 1.8 $\times 10^{-6}$	90%	—	DESIG=110
$\gamma f_4(2050)$	< 5.3 $\times 10^{-5}$	90%	4515	DESIG=104
$\gamma f_0(2200) \rightarrow \gamma K^+ K^-$	< 2 $\times 10^{-4}$	90%	4475	DESIG=69
$\gamma f_J(2220) \rightarrow \gamma K^+ K^-$	< 8 $\times 10^{-7}$	90%	4469	DESIG=60
$\gamma f_J(2220) \rightarrow \gamma \pi^+ \pi^-$	< 6 $\times 10^{-7}$	90%	—	DESIG=61
$\gamma f_J(2220) \rightarrow \gamma p\bar{p}$	< 1.1 $\times 10^{-6}$	90%	—	DESIG=62
$\gamma \eta(2225) \rightarrow \gamma \phi \phi$	< 3 $\times 10^{-3}$	90%	4469	DESIG=68
$\gamma X$	[x] < 3 $\times 10^{-5}$	90%	—	DESIG=66
$\gamma X\bar{X}$	[y] < 1 $\times 10^{-3}$	90%	—	DESIG=67
$\gamma X \rightarrow \gamma + \geq 4 \text{ prongs}$	[z] < 1.78 $\times 10^{-4}$	95%	—	DESIG=113
$\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	[aa] < 9 $\times 10^{-6}$	90%	—	DESIG=114
$\gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-$	[v] < 5.0 $\times 10^{-5}$	90%	—	DESIG=115

**Lepton Flavor (LF) violating or Invisible decays**

$\mu^\pm \tau^\mp$	<i>LF</i>	< 6.0 $\times 10^{-6}$	95%	4563
invisible		< 3.0 $\times 10^{-4}$	90%	—

NODE=M049;CLUMP=C

DESIG=116

DESIG=106

 **$\chi_{b0}(1P)$  [bb]** $I^G(J^{PC}) = 0^+(0^{++})$   
J needs confirmation.Mass  $m = 9859.44 \pm 0.42 \pm 0.31$  MeV

<b><math>\chi_{b0}(1P)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$\gamma \Upsilon(1S)$	< 6 %	90%	391	
$D^0 X$	< 10.4 %	90%	—	NODE=M076215;DESIG=1
$\pi^+ \pi^- K^+ K^- \pi^0$	< 1.6 $\times 10^{-4}$	90%	4875	DESIG=2
$2\pi^+ \pi^- K^- K_S^0$	< 5 $\times 10^{-5}$	90%	4875	DESIG=3
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	< 5 $\times 10^{-4}$	90%	4846	DESIG=4
$2\pi^+ 2\pi^- 2\pi^0$	< 2.1 $\times 10^{-4}$	90%	4905	DESIG=5
$2\pi^+ 2\pi^- K^+ K^-$	( 1.1 $\pm$ 0.6 ) $\times 10^{-4}$		4861	DESIG=6
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.7 $\times 10^{-4}$	90%	4846	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 5 $\times 10^{-4}$	90%	4828	DESIG=8
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 1.6 $\times 10^{-4}$	90%	4827	DESIG=9
$3\pi^+ 3\pi^-$	< 8 $\times 10^{-5}$	90%	4904	DESIG=10
$3\pi^+ 3\pi^- 2\pi^0$	< 6 $\times 10^{-4}$	90%	4881	DESIG=11
$3\pi^+ 3\pi^- K^+ K^-$	( 2.4 $\pm$ 1.2 ) $\times 10^{-4}$		4827	DESIG=12
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 1.0 $\times 10^{-3}$	90%	4808	DESIG=13
$4\pi^+ 4\pi^-$	< 8 $\times 10^{-5}$	90%	4880	DESIG=14
$4\pi^+ 4\pi^- 2\pi^0$	< 2.1 $\times 10^{-3}$	90%	4850	DESIG=15

NODE=M076M;DTYPE=M;OUR EVAL;  
→ NOT CHECKED ← **$\chi_{b1}(1P)$  [bb]** $I^G(J^{PC}) = 0^+(1^{++})$   
J needs confirmation.Mass  $m = 9892.78 \pm 0.26 \pm 0.31$  MeV

NODE=M077

NODE=M077M;DTYPE=M;OUR EVAL;  
→ NOT CHECKED ←

$\chi_{b1}(1P)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$\gamma \Upsilon(1S)$	(35 ± 8) %		423	NODE=M077215;DESIG=1
$D^0 X$	(12.6 ± 2.2) %		—	DESIG=2
$\pi^+ \pi^- K^+ K^- \pi^0$	( 2.0 ± 0.6) × 10 <sup>-4</sup>		4892	DESIG=3
$2\pi^+ \pi^- K^- K_S^0$	( 1.3 ± 0.5) × 10 <sup>-4</sup>		4892	DESIG=4
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	< 6 × 10 <sup>-4</sup>	90%	4863	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	( 8.0 ± 2.5) × 10 <sup>-4</sup>		4921	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	( 1.5 ± 0.5) × 10 <sup>-4</sup>		4878	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	( 3.5 ± 1.2) × 10 <sup>-4</sup>		4863	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	( 8.6 ± 3.2) × 10 <sup>-4</sup>		4845	DESIG=9
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	( 9.3 ± 3.3) × 10 <sup>-4</sup>		4844	DESIG=10
$3\pi^+ 3\pi^-$	( 1.9 ± 0.6) × 10 <sup>-4</sup>		4921	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	( 1.7 ± 0.5) × 10 <sup>-3</sup>		4898	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	( 2.6 ± 0.8) × 10 <sup>-4</sup>		4844	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	( 7.5 ± 2.6) × 10 <sup>-4</sup>		4825	DESIG=14
$4\pi^+ 4\pi^-$	( 2.6 ± 0.9) × 10 <sup>-4</sup>		4897	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	( 1.4 ± 0.6) × 10 <sup>-3</sup>		4867	DESIG=16

 $\chi_{b2}(1P)$  [bb]

$$I^G(JPC) = 0^+(2^{++})$$

J needs confirmation.

Mass  $m = 9912.21 \pm 0.26 \pm 0.31$  MeV

$\chi_{b2}(1P)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$\gamma \Upsilon(1S)$	(22 ± 4) %		442	NODE=M078215;DESIG=1
$D^0 X$	< 7.9 %	90%	—	DESIG=2
$\pi^+ \pi^- K^+ K^- \pi^0$	( 8 ± 5) × 10 <sup>-5</sup>		4902	DESIG=3
$2\pi^+ \pi^- K^- K_S^0$	< 1.0 × 10 <sup>-4</sup>	90%	4901	DESIG=4
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	( 5.3 ± 2.4) × 10 <sup>-4</sup>		4873	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	( 3.5 ± 1.4) × 10 <sup>-4</sup>		4931	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	( 1.1 ± 0.4) × 10 <sup>-4</sup>		4888	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	( 2.1 ± 0.9) × 10 <sup>-4</sup>		4872	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	( 3.9 ± 1.8) × 10 <sup>-4</sup>		4855	DESIG=9
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 5 × 10 <sup>-4</sup>	90%	4854	DESIG=10
$3\pi^+ 3\pi^-$	( 7.0 ± 3.1) × 10 <sup>-5</sup>		4931	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	( 1.0 ± 0.4) × 10 <sup>-3</sup>		4908	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	< 8 × 10 <sup>-5</sup>	90%	4854	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	( 3.6 ± 1.5) × 10 <sup>-4</sup>		4835	DESIG=14
$4\pi^+ 4\pi^-$	( 8 ± 4) × 10 <sup>-5</sup>		4907	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	( 1.8 ± 0.7) × 10 <sup>-3</sup>		4877	DESIG=16

 $\tau(2S)$ 

$$I^G(JPC) = 0^-(1^{--})$$

Mass  $m = 10.02326 \pm 0.00031$  GeVFull width  $\Gamma = 31.98 \pm 2.63$  keV $\Gamma_{ee} = 0.612 \pm 0.011$  keV

NODE=M052

NODE=M052M;DTYPE=M

NODE=M052W;DTYPE=G;OUR EVAL;  
→ NOT CHECKED ←NODE=M052W2;DTYPE=E;OUR EVAL;  
→ NOT CHECKED ←

<b><math>\Upsilon(2S)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)		
$\Upsilon(1S)\pi^+\pi^-$	(18.1 ± 0.4) %		475	NODE=M052215;DESIG=4	
$\Upsilon(1S)\pi^0\pi^0$	( 8.6 ± 0.4 ) %		480	DESIG=5	
$\tau^+\tau^-$	( 2.00 ± 0.21 ) %		4686	DESIG=3	
$\mu^+\mu^-$	( 1.93 ± 0.17 ) %	S=2.2	5011	DESIG=1	
$e^+e^-$	( 1.91 ± 0.16 ) %		5012	DESIG=2	
$\Upsilon(1S)\pi^0$	< 1.8 × 10 <sup>-4</sup>	CL=90%	531	DESIG=10	
$\Upsilon(1S)\eta$	( 2.1 + 0.8 ) × 10 <sup>-4</sup>		126	DESIG=6	
$J/\psi(1S)$ anything	< 6 × 10 <sup>-3</sup>	CL=90%	4533	DESIG=20	
$\bar{d}$ anything	( 3.4 ± 0.6 ) × 10 <sup>-5</sup>		—	DESIG=16	
hadrons	(94 ± 11) %		—	DESIG=101	
$ggg$	(58.8 ± 1.2) %		—	DESIG=105	
$\gamma gg$	( 8.8 ± 1.1 ) %		—	DESIG=106	
<b>Radiative decays</b>					
$\gamma \chi_{b1}(1P)$	( 6.9 ± 0.4 ) %		130	NODE=M052;CLUMP=A	
$\gamma \chi_{b2}(1P)$	( 7.15 ± 0.35 ) %		110	DESIG=8	
$\gamma \chi_{b0}(1P)$	( 3.8 ± 0.4 ) %		162	DESIG=7	
$\gamma f_0(1710)$	< 5.9 × 10 <sup>-4</sup>	CL=90%	4864	DESIG=9	
$\gamma f'_2(1525)$	< 5.3 × 10 <sup>-4</sup>	CL=90%	4896	DESIG=13	
$\gamma f_2(1270)$	< 2.41 × 10 <sup>-4</sup>	CL=90%	4931	DESIG=12	
$\gamma \eta_b(1S)$	( 3.9 ± 1.5 ) × 10 <sup>-4</sup>		612	DESIG=11	
$\gamma X \rightarrow \gamma + \geq 4$ prongs	[cc] < 1.95 × 10 <sup>-4</sup>	CL=95%	—	DESIG=102	
				DESIG=103	
<b>Lepton Flavor (LF) violating decays</b>					
$\mu^\pm \tau^\mp$	LF	< 1.44 × 10 <sup>-5</sup>	CL=95%	4854	NODE=M052;CLUMP=B DESIG=104

<b><math>\chi_{b0}(2P)</math> [bb]</b>	$I^G(J^{PC}) = 0^+(0^{++})$		
	$J$ needs confirmation.		
Mass $m = 10.2325 \pm 0.0004 \pm 0.0005$ GeV			
<b><math>\chi_{b0}(2P)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level (MeV/c)	
$\gamma \Upsilon(2S)$	(4.6±2.1) %	207	NODE=M079215;DESIG=2
$\gamma \Upsilon(1S)$	( 9 ± 6 ) × 10 <sup>-3</sup>	743	DESIG=1
$D^0 X$	< 8.2 %	90%	—
$\pi^+\pi^- K^+ K^- \pi^0$	< 3.4 × 10 <sup>-5</sup>	90%	5064
$2\pi^+\pi^- K^- K_S^0$	< 5 × 10 <sup>-5</sup>	90%	5063
$2\pi^+\pi^- K^- K_S^0 2\pi^0$	< 2.2 × 10 <sup>-4</sup>	90%	5036
$2\pi^+ 2\pi^- 2\pi^0$	< 2.4 × 10 <sup>-4</sup>	90%	5092
$2\pi^+ 2\pi^- K^+ K^-$	< 1.5 × 10 <sup>-4</sup>	90%	5050
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.2 × 10 <sup>-4</sup>	90%	5035
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 1.1 × 10 <sup>-3</sup>	90%	5019
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 7 × 10 <sup>-4</sup>	90%	5018
$3\pi^+ 3\pi^-$	< 7 × 10 <sup>-5</sup>	90%	5091
$3\pi^+ 3\pi^- 2\pi^0$	< 1.2 × 10 <sup>-3</sup>	90%	5070
$3\pi^+ 3\pi^- K^+ K^-$	< 1.5 × 10 <sup>-4</sup>	90%	5017
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 7 × 10 <sup>-4</sup>	90%	4999
$4\pi^+ 4\pi^-$	< 1.7 × 10 <sup>-4</sup>	90%	5069
$4\pi^+ 4\pi^- 2\pi^0$	< 6 × 10 <sup>-4</sup>	90%	5039

<b><math>\chi_{b1}(2P)</math> [bb]</b>	$I^G(J^{PC}) = 0^+(1^{++})$	
	$J$ needs confirmation.	
Mass $m = 10.25546 \pm 0.00022 \pm 0.00050$ GeV		
$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV		

$\chi_{b1}(2P)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor	$p$ (MeV/c)	
$\omega \Upsilon(1S)$	( 1.63 $\pm$ 0.40 ) %		135	NODE=M080215;DESIG=3
$\gamma \Upsilon(2S)$	( 21 $\pm$ 4 ) %	1.5	230	DESIG=2
$\gamma \Upsilon(1S)$	( 8.5 $\pm$ 1.3 ) %	1.3	764	DESIG=1
$\pi\pi\chi_{b1}(1P)$	( 8.6 $\pm$ 3.1 ) $\times$ 10 <sup>-3</sup>		238	DESIG=4
$D^0 X$	( 8.8 $\pm$ 1.7 ) %		—	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	( 3.1 $\pm$ 1.0 ) $\times$ 10 <sup>-4</sup>		5075	DESIG=6
$2\pi^+\pi^-K^-K_S^0$	( 1.1 $\pm$ 0.5 ) $\times$ 10 <sup>-4</sup>		5075	DESIG=7
$2\pi^+\pi^-K^-K_S^0 2\pi^0$	( 7.7 $\pm$ 3.2 ) $\times$ 10 <sup>-4</sup>		5047	DESIG=8
$2\pi^+2\pi^-2\pi^0$	( 5.9 $\pm$ 2.0 ) $\times$ 10 <sup>-4</sup>		5104	DESIG=9
$2\pi^+2\pi^-K^+K^-$	( 10 $\pm$ 4 ) $\times$ 10 <sup>-5</sup>		5062	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	( 5.5 $\pm$ 1.8 ) $\times$ 10 <sup>-4</sup>		5047	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	( 10 $\pm$ 4 ) $\times$ 10 <sup>-4</sup>		5030	DESIG=12
$3\pi^+2\pi^-K^-K_S^0\pi^0$	( 6.7 $\pm$ 2.6 ) $\times$ 10 <sup>-4</sup>		5029	DESIG=13
$3\pi^+3\pi^-$	( 1.2 $\pm$ 0.4 ) $\times$ 10 <sup>-4</sup>		5103	DESIG=14
$3\pi^+3\pi^-2\pi^0$	( 1.2 $\pm$ 0.4 ) $\times$ 10 <sup>-3</sup>		5081	DESIG=15
$3\pi^+3\pi^-K^+K^-$	( 2.0 $\pm$ 0.8 ) $\times$ 10 <sup>-4</sup>		5029	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	( 6.1 $\pm$ 2.2 ) $\times$ 10 <sup>-4</sup>		5011	DESIG=17
$4\pi^+4\pi^-$	( 1.7 $\pm$ 0.6 ) $\times$ 10 <sup>-4</sup>		5080	DESIG=18
$4\pi^+4\pi^-2\pi^0$	( 1.9 $\pm$ 0.7 ) $\times$ 10 <sup>-3</sup>		5051	DESIG=19

 $\chi_{b2}(2P)$  [bb]

$$J^G(J^{PC}) = 0^+(2^{++})$$

J needs confirmation.

Mass  $m = 10.26865 \pm 0.00022 \pm 0.00050$  GeV $m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.5 \pm 0.6$  MeV

NODE=M081

NODE=M081M;DTYPE=M;OUR EVAL;  
 → NOT CHECKED ←  
 NODE=M081M2;DTYPE=D

$\chi_{b2}(2P)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$\omega \Upsilon(1S)$	( 1.10 $\pm$ 0.34 ) %		194	NODE=M081215;DESIG=3
$\gamma \Upsilon(2S)$	( 16.2 $\pm$ 2.4 ) %		242	DESIG=2
$\gamma \Upsilon(1S)$	( 7.1 $\pm$ 1.0 ) %		777	DESIG=1
$\pi\pi\chi_{b2}(1P)$	( 6.0 $\pm$ 2.1 ) $\times$ 10 <sup>-3</sup>		229	DESIG=4
$D^0 X$	< 2.4 %	90%	—	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	< 1.1 $\times$ 10 <sup>-4</sup>	90%	5082	DESIG=6
$2\pi^+\pi^-K^-K_S^0$	< 9 $\times$ 10 <sup>-5</sup>	90%	5082	DESIG=7
$2\pi^+\pi^-K^-K_S^0 2\pi^0$	< 7 $\times$ 10 <sup>-4</sup>	90%	5054	DESIG=8
$2\pi^+2\pi^-2\pi^0$	( 3.9 $\pm$ 1.6 ) $\times$ 10 <sup>-4</sup>		5110	DESIG=9
$2\pi^+2\pi^-K^+K^-$	( 9 $\pm$ 4 ) $\times$ 10 <sup>-5</sup>		5068	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	( 2.4 $\pm$ 1.1 ) $\times$ 10 <sup>-4</sup>		5054	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	( 4.7 $\pm$ 2.3 ) $\times$ 10 <sup>-4</sup>		5037	DESIG=12
$3\pi^+2\pi^-K^-K_S^0\pi^0$	< 4 $\times$ 10 <sup>-4</sup>	90%	5036	DESIG=13
$3\pi^+3\pi^-$	( 9 $\pm$ 4 ) $\times$ 10 <sup>-5</sup>		5110	DESIG=14
$3\pi^+3\pi^-2\pi^0$	( 1.2 $\pm$ 0.4 ) $\times$ 10 <sup>-3</sup>		5088	DESIG=15
$3\pi^+3\pi^-K^+K^-$	( 1.4 $\pm$ 0.7 ) $\times$ 10 <sup>-4</sup>		5036	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	( 4.2 $\pm$ 1.7 ) $\times$ 10 <sup>-4</sup>		5017	DESIG=17
$4\pi^+4\pi^-$	( 9 $\pm$ 5 ) $\times$ 10 <sup>-5</sup>		5087	DESIG=18
$4\pi^+4\pi^-2\pi^0$	( 1.3 $\pm$ 0.5 ) $\times$ 10 <sup>-3</sup>		5058	DESIG=19

 $r(3S)$ 

$$J^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 10.3552 \pm 0.0005$  GeVFull width  $\Gamma = 20.32 \pm 1.85$  keV $\Gamma_{ee} = 0.443 \pm 0.008$  keV

NODE=M048

NODE=M048M;DTYPE=M

NODE=M048W;DTYPE=G;OUR EVAL;  
 → NOT CHECKED ←

NODE=M048W2;DTYPE=E;OUR EVAL;  
 → NOT CHECKED ←

<b><math>\Upsilon(3S)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	$p$ (MeV/c)		
$\Upsilon(2S)$ anything	( $10.6 \pm 0.8$ ) %		296	NODE=M048215;DESIG=8	
$\Upsilon(2S)\pi^+\pi^-$	( $2.45 \pm 0.23$ ) %	S=1.1	177	DESIG=4	
$\Upsilon(2S)\pi^0\pi^0$	( $1.85 \pm 0.14$ ) %		190	DESIG=10	
$\Upsilon(2S)\gamma\gamma$	( $5.0 \pm 0.7$ ) %		327	DESIG=12	
$\Upsilon(2S)\pi^0$	< $5.1 \times 10^{-4}$	CL=90%	298	DESIG=107	
$\Upsilon(1S)\pi^+\pi^-$	( $4.40 \pm 0.10$ ) %		813	DESIG=3	
$\Upsilon(1S)\pi^0\pi^0$	( $2.20 \pm 0.13$ ) %		816	DESIG=11	
$\Upsilon(1S)\eta$	< $1.8 \times 10^{-4}$	CL=90%	677	DESIG=9	
$\Upsilon(1S)\pi^0$	< $7 \times 10^{-5}$	CL=90%	846	DESIG=106	
$\tau^+\tau^-$	( $2.29 \pm 0.30$ ) %		4863	DESIG=16	
$\mu^+\mu^-$	( $2.18 \pm 0.21$ ) %	S=2.1	5177	DESIG=1	
$e^+e^-$	seen		5178	DESIG=2;OUR EVAL; $\rightarrow$ NOT CHECKED $\leftarrow$	
$ggg$	( $35.7 \pm 2.6$ ) %		—	DESIG=109	
$\gamma gg$	( $9.7 \pm 1.8$ ) $\times 10^{-3}$		—	DESIG=110	
<b>Radiative decays</b>					
$\gamma\chi_{b2}(2P)$	( $13.1 \pm 1.6$ ) %	S=3.4	86	NODE=M048;CLUMP=B	
$\gamma\chi_{b1}(2P)$	( $12.6 \pm 1.2$ ) %	S=2.4	99	DESIG=5	
$\gamma\chi_{b0}(2P)$	( $5.9 \pm 0.6$ ) %	S=1.4	122	DESIG=6	
$\gamma\chi_{b2}(1P)$	< $1.9$ %	CL=90%	434	DESIG=7	
$\gamma\chi_{b1}(1P)$	< $1.7 \times 10^{-3}$	CL=90%	452	DESIG=103	
$\gamma\chi_{b0}(1P)$	( $3.0 \pm 1.1$ ) $\times 10^{-3}$		484	DESIG=104	
$\gamma\eta_b(2S)$	< $6.2 \times 10^{-4}$	CL=90%	—	DESIG=13	
$\gamma\eta_b(1S)$	( $5.1 \pm 0.7$ ) $\times 10^{-4}$		919	DESIG=14	
$\gamma X \rightarrow \gamma + \geq 4$ prongs	[ $dd$ ] < $2.2 \times 10^{-4}$	CL=95%	—	DESIG=15	
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[ $ee$ ] < $1.6 \times 10^{-4}$	CL=90%	—	DESIG=102	
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$			—	DESIG=108	
<b>Lepton Flavor (<i>LF</i>) violating decays</b>					
$\mu^\pm\tau^\mp$	<i>LF</i>	< $2.03 \times 10^{-5}$	CL=95%	5025	NODE=M048;CLUMP=C DESIG=105

**$\Upsilon(4S)$   
or  $\Upsilon(10580)$**

$$\mathcal{I}^G(J^{PC}) = 0^-(1^{--})$$

Mass  $m = 10.5794 \pm 0.0012$  GeV

Full width  $\Gamma = 20.5 \pm 2.5$  MeV

$\Gamma_{ee} = 0.272 \pm 0.029$  keV ( $S = 1.5$ )

NODE=M047

NODE=M047M;DTYPE=M

NODE=M047W;DTYPE=G

NODE=M047W1;DTYPE=E

<b>T(4S) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$B\bar{B}$	> 96 %	95%	328	
$B^+B^-$	(51.6 ± 0.6) %	334		NODE=M047215;DESIG=8;OUR EST;
$D_s^+$ anything + c.c.	(19.6 ± 2.7) %	—		DESIG=10 NOT CHECKED ←
$B^0\bar{B}^0$	(48.4 ± 0.6) %	328		DESIG=12
$J/\psi K_S^0 (J/\psi, \eta_c) K_S^0$	< 4 × 10 <sup>-7</sup>	90%	—	DESIG=11
non- $B\bar{B}$	< 4 %	95%	—	DESIG=15
$e^+e^-$	(1.57 ± 0.08) × 10 <sup>-5</sup>	5290		DESIG=6
$\rho^+\rho^-$	< 5.7 × 10 <sup>-6</sup>	90%	5233	DESIG=1
$J/\psi(1S)$ anything	< 1.9 × 10 <sup>-4</sup>	95%	—	DESIG=16
$D^{*+}$ anything + c.c.	< 7.4 %	90%	5099	DESIG=2
$\phi$ anything	(7.1 ± 0.6) %	5240		DESIG=3
$\phi\eta$	< 1.8 × 10 <sup>-6</sup>	90%	5226	DESIG=4
$\phi\eta'$	< 4.3 × 10 <sup>-6</sup>	90%	5196	DESIG=13
$\rho\eta$	< 1.3 × 10 <sup>-6</sup>	90%	5247	DESIG=18
$\rho\eta'$	< 2.5 × 10 <sup>-6</sup>	90%	5217	DESIG=19
$\gamma(1S)$ anything	< 4 × 10 <sup>-3</sup>	90%	1053	DESIG=20
$\gamma(1S)\pi^+\pi^-$	(8.1 ± 0.6) × 10 <sup>-5</sup>	1026		DESIG=5
$\gamma(1S)\eta$	(1.96 ± 0.11) × 10 <sup>-4</sup>	924		DESIG=7
$\gamma(2S)\pi^+\pi^-$	(8.6 ± 1.3) × 10 <sup>-5</sup>	468		DESIG=17
$d$ anything	< 1.3 × 10 <sup>-5</sup>	90%	—	DESIG=9
				DESIG=14

**T(10860)**

$I^G(J^{PC}) = 0^-(1^{--})$

Mass  $m = 10.865 \pm 0.008$  GeV (S = 1.1)Full width  $\Gamma = 110 \pm 13$  MeV $\Gamma_{ee} = 0.31 \pm 0.07$  keV (S = 1.3)

NODE=M092

NODE=M092M;DTYPE=M

NODE=M092W;DTYPE=G

NODE=M092W1;DTYPE=E

<b>T(10860) DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$p$ (MeV/c)	
$e^+e^-$	(2.8 ± 0.7) × 10 <sup>-6</sup>	5432		NODE=M092215;DESIG=1
$B\bar{B}X$	(59 ± 14) %	—		DESIG=9
$B\bar{B}$	< 13.8 %	90%	1280	DESIG=2
$B\bar{B}^*$ + c.c.	(14 ± 6) %	—		DESIG=3
$B^*\bar{B}^*$	(44 ± 11) %	—		DESIG=4
$B\bar{B}^{(*)}\pi$	< 19.7 %	90%	—	DESIG=10
$B\bar{B}\pi\pi$	< 8.9 %	90%	442	DESIG=11
$B_s^{(*)}\bar{B}_s^{(*)}$	(19.3 ± 2.9) %	—		DESIG=16
$B_s\bar{B}_s$	(5 ± 5) × 10 <sup>-3</sup>	—		DESIG=5
$B_s\bar{B}_s^*$ + c.c.	(1.4 ± 0.6) %	—		DESIG=7
$B_s^*\bar{B}_s^*$	(17.4 ± 2.7) %	—		DESIG=8
$\gamma(1S)\pi^+\pi^-$	(5.3 ± 0.6) × 10 <sup>-3</sup>	1288		DESIG=17
$\gamma(2S)\pi^+\pi^-$	(7.8 ± 1.3) × 10 <sup>-3</sup>	763		DESIG=18
$\gamma(3S)\pi^+\pi^-$	(4.8 ± 1.9) × 10 <sup>-3</sup>	416		DESIG=19
$\gamma(1S)K^+K^-$	(6.1 ± 1.8) × 10 <sup>-4</sup>	933		DESIG=20

**Inclusive Decays.**

These decay modes are submodes of one or more of the decay modes above.

$\phi$ anything	(13.8 ± 2.4) %	—	DESIG=12
$D^0$ anything + c.c.	(108 ± 8) %	—	DESIG=13
$D_s$ anything + c.c.	(48 ± 6) %	—	DESIG=6
$J/\psi$ anything	(2.06 ± 0.21) %	—	DESIG=14

**T(11020)**

$I^G(J^{PC}) = 0^-(1^{--})$

Mass  $m = 11.019 \pm 0.008$  GeVFull width  $\Gamma = 79 \pm 16$  MeV $\Gamma_{ee} = 0.130 \pm 0.030$  keV

NODE=M093

NODE=M093M;DTYPE=M

NODE=M093W;DTYPE=G

NODE=M093W1;DTYPE=E

<b><math>\Upsilon(11020)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$e^+ e^-$	$(1.6 \pm 0.5) \times 10^{-6}$	5510

NODE=M093215;DESIG=1

**NOTES**

- [a] See the “Note on scalar mesons” in the  $f_0(1370)$  Particle Listings . The interpretation of this entry as a particle is controversial.
- [b] See the “Note on  $\rho(770)$ ” in the  $\rho(770)$  Particle Listings .
- [c] The  $\omega\rho$  interference is then due to  $\omega\rho$  mixing only, and is expected to be small. If  $e\mu$  universality holds,  $\Gamma(\rho^0 \rightarrow \mu^+ \mu^-) = \Gamma(\rho^0 \rightarrow e^+ e^-) \times 0.99785$ .
- [d]  $C$  parity forbids this to occur as a single-photon process.
- [e] See the “Note on scalar mesons” in the  $f_0(1370)$  Particle Listings .
- [f] See the “Note on  $a_1(1260)$ ” in the  $a_1(1260)$  Particle Listings in PDG 06, Journal of Physics, G **33** 1 (2006).
- [g] This is only an educated guess; the error given is larger than the error on the average of the published values. See the Particle Listings for details.
- [h] See the “Note on non- $q\bar{q}$  mesons” in the Particle Listings in PDG 06, Journal of Physics, G **33** 1 (2006).
- [i] See the “Note on the  $\eta(1405)$ ” in the  $\eta(1405)$  Particle Listings.
- [j] See the “Note on the  $f_1(1420)$ ” in the  $\eta(1405)$  Particle Listings.
- [k] See also the  $\omega(1650)$  Particle Listings.
- [l] See the “Note on the  $\rho(1450)$  and the  $\rho(1700)$ ” in the  $\rho(1700)$  Particle Listings.
- [m] See also the  $\omega(1420)$  Particle Listings.
- [n] See the “Note on  $f_0(1710)$ ” in the  $f_0(1710)$  Particle Listings in 2004 edition of *Review of Particle Physics*.
- [o] See the “Note on  $f_0(1370)$ ” in the  $f_0(1370)$  Particle Listings and in the 1994 edition.
- [p] See the note in the  $L(1770)$  Particle Listings in Reviews of Modern Physics **56** S1 (1984), p. S200. See also the “Note on  $K_2(1770)$  and the  $K_2(1820)$ ” in the  $K_2(1770)$  Particle Listings .
- [q] See the “Note on  $K_2(1770)$  and the  $K_2(1820)$ ” in the  $K_2(1770)$  Particle Listings .
- [r] The value is for the sum of the charge states or particle/antiparticle states indicated.
- [s] Includes  $p\bar{p}\pi^+\pi^-\gamma$  and excludes  $p\bar{p}\eta$ ,  $p\bar{p}\omega$ ,  $p\bar{p}\eta'$ .
- [t]  $J^{PC}$  known by production in  $e^+ e^-$  via single photon annihilation.  $J^G$  is not known; interpretation of this state as a single resonance is unclear because of the expectation of substantial threshold effects in this energy region.
- [u] See COAN 06 for details.
- [v]  $2m_\tau < M(\tau^+ \tau^-) < 7500$  MeV.
- [w]  $2 < m_{K^+ K^-} < 3$  GeV.
- [x]  $X$  = pseudoscalar with  $m < 7.2$  GeV
- [y]  $X\bar{X}$  = vectors with  $m < 3.1$  GeV
- [z]  $1.5$  GeV  $< m_X < 5.0$  GeV
- [aa]  $201 < M(\mu^+ \mu^-) < 3565$  MeV.
- [bb] Spectroscopic labeling for these states is theoretical, pending experimental information.
- [cc]  $1.5$  GeV  $< m_X < 5.0$  GeV
- [dd]  $1.5$  GeV  $< m_X < 5.0$  GeV
- [ee] For  $m_{\tau^+ \tau^-}$  in the ranges 4.03–9.52 and 9.61–10.10 GeV.

LINKAGE=NS2

LINKAGE=NRH

LINKAGE=MD2

LINKAGE=CS

LINKAGE=NSM

LINKAGE=NA1

LINKAGE=MS

LINKAGE=NQQ

LINKAGE=MG

LINKAGE=MDA

LINKAGE=MDE

LINKAGE=MDC

LINKAGE=MDF

LINKAGE=NFJ

LINKAGE=NF0

LINKAGE=MDB

LINKAGE=MBD

LINKAGE=SG

LINKAGE=MF

LINKAGE=MPD

LINKAGE=COA

LINKAGE=E49

LINKAGE=G49

LINKAGE=A49

LINKAGE=B49

LINKAGE=C49

LINKAGE=D49

LINKAGE=MJ

LINKAGE=C52

LINKAGE=C48

LINKAGE=MRG